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ABSTRACT

The overall objective of the educational television project in Latin America was to provide a basis for assessing the feasibility and utility of satellite-transmitted educational broadcasting systems. The specific objectives of the project were to 1) identify needs where broadcast media offer special promise; 2) estimate the amount of capital and recurring costs of satellite-based educational systems; 3) compare methods of distributing educational broadcasts; 4) review organizational and political implications of proposed alternative distribution systems; and 5) develop and apply a rough technoeconomic model. Fifteen countries were included in the various analyses made during the study, but all of the Central American countries were considered as one group. While mainly dealing with feasibility questions for educational broadcast systems in terms of technology and cost effectiveness, the report attempted to reflect what Latin Americans say they are trying to accomplish in education and training. It was concluded that instructional television was not likely to offer lower costs than conventional instruction. An entire system that included instructional television as a component would probably be more expensive than traditional processes, but it would also be more effective. (Author/HAB)

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Volume III

SATELLITE-DISTRIBUTED EDUCATIONAL TELEVISION FOR DEVELOPING COUNTRIES — THE CASE OF LATIN AMERICA

Prepared for:

AGENCY FOR INTERNATIONAL DEVELOPMENT
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SRI Project 7150

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Satellite-Distributed Educational Television for Developing Countries--
The Case of Latin America

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PREFACE

In March 1968, the U.S. Agency for International Development, in support of the President's Task Force on Communications Policy, contracted with Stanford Research Institute to study educational applications of communication satellites for developing countries. The study was designed to determine the potential of satellite-delivered educational broadcasts through analyses of two developing regions. A single large nation, India, and a multinational region, Latin America, were chosen as case studies to illustrate the scope of possible applications. The emphasis of the case studies was to be on the educational, economic, cultural, organizational, and political factors affecting the feasibility and utility of satellite communication.

This report deals with Latin America. Volumes in the project series include:

Volume I:	Satellite-Distributed Educational Television for Developing Countries--Summary
Volume II:	Communication Satellites for Education and Development--The Case of India
Volume III:	Satellite-Distributed Educational Television for Developing Countries--The Case of Latin America

Volume IV: Satellite-Distributed Educational Television for Developing Countries--Working Papers

1. Nonhardware Components of an Instructional Television system for a Developing Country
2. Considerations in Deciding Whether and How to Introduce an Educational Satellite
3. Film Versus Television in Education
4. Technical Considerations of Satellite Communication Systems for Education
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I INTRODUCTION

Objectives

The overall objective of the project was to provide a basis for assessing the feasibility and utility of satellite-transmitted educational broadcasting systems for developing countries. The specific objectives of the case study of Latin America were to:

- Identify needs where broadcast media offer special promise.
- Estimate the approximate orders of magnitude of capital and recurring costs of satellite-based educational systems.
- Compare terrestrial and satellite methods of distributing educational broadcasts according to criteria of effectiveness, growth potential, and cost.
- Review organizational and political implications of proposed alternative distribution systems.
- Develop and apply a rough technoeconomic model that can be used to explore the technical and cost consequences of planning options related to various distribution systems.

Background

In the field interviews with Latin Americans, it was frequently necessary to answer certain questions about the subject matter and purpose of the study. These questions and their answers can also help clarify the scope of this report and are presented below:

Question: What can a communications satellite do for education?

Answer: It can distribute ETV (educational television) or educational radio over a vast area--for example, over all of Latin America.

Question: Where does the educational program originate?

Answer: That decision will be made by Latin Americans. One possibility is for each country to originate its own educational programs for domestic distribution by the satellite. Latin American governments may also want to exchange some educational programs by the satellite. The objective of the study is to assess the potential for either or both of these possibilities.

Question: If the United States is not contemplated as a program source, then what role might the United States play?

Answer: As one of two countries (thus far) that has developed communications satellite technology, the United States is examining the long range potential of that technology. If Latin American countries find that satellite communication has utility and feasibility for attaining their educational objectives, they could explore a cooperative arrangement with the United States to utilize the technology. No instructions regarding such arrangements have been received from the U.S. government. If the Latin American counterparts have views on this, the Institute would like to reflect them in its report.

Question: Can the satellite-distributed programs be received directly by a television set equipped with a rooftop antenna?

Answer: It appears that this distribution method, referred to as a direct broadcast satellite system, will be possible in about 1975, following the completion of research and development programs that are now in process or are planned. However, even by 1975, the rooftop antenna will have to be more elaborate than ordinary antennas, and the set may have to be built or modified to receive special frequencies and the relatively weak satellite signal. But a satellite already can link a transmitting ground station to a receiving ground station, which can redistribute the program over conventional television transmitters or over microwave networks. The latter method is referred to as a rebroadcast satellite system.

Question: Can Latin American country "B" receive Latin American country "A's" domestic programs that are distributed by satellite?

Answer: Yes. In fact, because the satellite inevitably affects international communication, its use would need to be agreed on by countries within its area of coverage.

Question: Besides satellite distribution, are there other ways to deliver ETV throughout Latin America?

Answer: Yes. Video tapes of programs can be shipped by surface or air transport to nearby or distant television stations for replaying there. Also, by 1972, quite a few of the major cities in Latin America will be connected by microwave links capable of carrying at least one television channel. Satellite distributed ETV, however, is probably the only one of these alternatives that can provide simultaneous reception throughout Latin America. It is not yet known how important simultaneity may be in educational applications.

Scope

Fifteen countries were included in the various analyses made during the study. The 13 countries visited by the project team were: Mexico Nicaragua, El Salvador, Costa Rica, Panama, Venezuela, Colombia, Peru, Bolivia, Chile, Argentina, Uruguay, and Brazil. Although Honduras and Guatemala were not visited, they are included in tabular material where all of the Central American countries are considered as a group.

Ecuador, Paraguay, and the Caribbean-oriented countries are omitted in the above list. Their omission is not intended to indicate that ETV lacks potential in these countries. The omission was solely to keep the duration of the field trip within the time allotted for the research.

Certain premises and assumptions relevant to satellite-distributed television were brought to the study by the project team. The following discussion attempts to make some of these explicit.

Emphasis on Television

The principal issues to which the team addressed itself were the potential for satellite-distributed ETV and comparisons of satellite systems with conventional delivery means. While the satellite is capable of delivering both radio education and television education, the emphasis of the study was on television because: (1) it is axiomatic that a medium that combines two senses--visual and audio--has a greater learning impact than the single (audio) capability of radio, and (2) satellite coverage offers more of a quantum jump over the geographical coverage of a television transmitter than over the coverage of a radio transmitter. It appears unlikely that radio education will be a primary application of communications satellite technology. Radio may be important as a back-up to ETV and as a means of adding low cost channels for review, advanced studies, or instruction in the local language. This point is discussed by Andrew D. Cohen in Working Paper No. 7, Volume IV.

It is possible that satellite-distributed broadcast media will be used in unconventional ways both in developed and developing countries. There has been speculation on the following:

- Use of television for the distribution of still or slow-scan images, instead of moving images. This would reduce the band width required, in comparison to conventional television, or it would permit carrying many more channels within specified frequencies.
- Use of conventional television or of slow-scan television on a two-way basis to give the classroom teacher, or even some of his students, an opportunity to feed back messages to the source of

the educational programming. Two-way voice capability with ETV is just becoming operational in the United States. The two-way capability is very attractive from the standpoint of what is known about learning theory. On the other hand, the two-way capability is more expensive than conventional ETV in terms of equipment and staffing.

The study concentrates on the existing, more conventional modes of ETV in the belief that they have undeveloped potential for use in Latin American education. Proven and simple mass applications are those most likely to draw on the comparative advantage of the satellite distribution method. This report concentrates more on the potential for ETV, regardless of how it is delivered, than on the potential for satellite communication itself.

Emphasis on Latin American Plans

This report attempts to reflect what Latin Americans say they are trying to accomplish in education and training, rather than what the project team might believe to be in the interests of development of a country or region. The preferences of Latin Americans regarding the use of broadcast media have also been considered.

The approach of seeking policy-makers' views on the use of media as well as on the objectives is based on the belief that whether and how to use the satellite communication media are not just technical choices, but also policy decisions. This should not be interpreted to mean that the SRI staff has not made suggestions for ETV applications. On the contrary, many of the applications explored in this study were suggested by SRI personnel, usually based on experience in developing countries.

Belief in Effectiveness of Instructional Television

The SRI project team believes that ITV (instructional television)* is effective for achieving educational advance. Appendix A, by Wilbur Schramm, summarizes the evidence attesting to this effectiveness. A statement prepared by a Latin American group of experts on ETV (convoked by the Secretary General of the Organization of American States in 1967) is endorsed. This group agreed that ETV is capable of performing the following functions:†

1. To extend and improve education, through the following activities:

    a. Renovating and modernizing the educational systems. In Latin America the need has arisen for a more adequate adjustment of educational systems to the demands of economic, social, and cultural development. Educational television is an extremely valuable resource for the accomplishment of the necessary measures.

    b. Widening the radius of action of education. Among the major problems of Latin America that should be pointed out are the considerable distances to be covered and the large masses of the uneducated and uncultured who act as a brake on the development of these peoples. Educational television is a vehicle to bring educational and cultural action to the most remote areas and to promote change in the way of life of the people who most need it.

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* Throughout this report ITV refers to ETV in which reception is organized, as in a classroom or telecenter.

† Excerpted from Multinational Projects Prepared by the General Secretariat of the Organization of American States, OAS Document 4, Appendix I, Dec. 21, 1967, pp. 38-39.

c. Placing the best teachers within reach of large audiences. Latin America has too few teachers, especially highly qualified teachers; educational television will make it possible to multiply the impact of the best teaching talent by making it accessible to a greater number of students.

d. Making possible a solution of the problem of illiteracy. The joint efforts of educational television and other audio-visual media will be able to contribute to the solution of the problem of illiteracy.

e. Helping adults to complete their elementary or secondary education. Experiments carried out in some Latin American countries have demonstrated that educational television is a valuable aid in the supplementing, updating, and renewal of knowledge, primarily at the elementary and secondary levels, in the case of adults.

f. Instructing children and adolescents in regions lacking educational facilities. The experience of several countries has demonstrated that educational television is a suitable means of reaching areas where there is a shortage of schools and teachers.

g. Aiding teachers in professional improvement. Educational television is one of the most adequate resources for raising the professional level of teachers.

h. Giving better-quality teaching at the level of higher education. In professional training at the level of higher education television has become a valuable aid.

i. Bringing the university to the people. The universities are higher-level institutions of study that should contribute to the orientation of peoples. Television makes it possible to direct university action toward the people, in order to bring them technical, scientific, and cultural benefits.

2. To contribute to the economic and social development of the countries, to which end it should:

a. Stimulate economic, social, and cultural integration at the national level. Cooperate, as a part of the educational system, in the integration of large sectors of the population into the economic, social, and cultural life of the country.

b. Favor the improvement of living standards in rural communities. Experience has demonstrated in some countries that educational television can be an effective means for the improvement of rural standards of living.

c. Facilitate vocational or technical and advanced training of industrial workers. Latin America lacks the specialized manpower provided by skilled workers and middle-level technicians, and educational television can aid in the solution of this problem through various training courses.

3. To contribute to international understanding and to Latin American integration.

Educational television is a resource that can help in attaining one of the goals set forth by the Presidents in the Punta del Este meeting, namely, the strengthening of education for international understanding and Latin American integration.

The project team subscribes to the thesis advanced by Schramm, Coombs, Kahnert, and Lyle that broadcast media are most useful in a context of change. It is their opinion that "the broadcast media. . . are most likely to be used at their full power and efficiency when a system is trying to solve stubborn basic problems or to bring about some fundamental change. This is why the new media are especially attractive to developing countries, even though the scarcity of economic and technological resources and of trained persons makes it more difficult to introduce them there."*

A corollary to the above premise is that interesting applications for broadcast media are those in which they can become developmental tools--an ingredient in the new kind of team teaching described by Schramm, et al., as follows:*

---

* Schramm, Wilbur, et al., The New Media: Memo to Educational Planners, UNESCO IIEP, 1967, Chapter 3, p. 98.

> In effect, then, by their very nature the new educational media enter into a kind of team teaching. It is not precisely the kind of teaching usually called 'team teaching' in modern schools, where the term usually refers to the division of specialized responsibilities for a large group of pupils among a group of teachers and assistants. But the principle is the same. Each teacher has a special task which, supposedly, he can do best. In the case of the media, a teacher at the point of input, a teacher at the point of reception, perhaps another teacher speaking through textual or exercise materials, combine their efforts, each doing his own part of the task of stimulating students' learning activity. When the media are used for adult education (let us take agriculture as a possible subject area) the teacher at the transmitting end may be an extension specialist, the supervisor at the receiving end may be a forum chairman or village-level worker, and the materials may be prepared by a group at the agriculture research station. But the division of responsibilities is the same. Obviously such a division and combination of responsibility requires a clear and common set of learning objectives, the will to work together, careful planning, and adequate training in the special skills required.

ITV is not likely to offer lower costs than conventional instruction. An entire system that includes ITV as a component will probably be more expensive than traditional processes, but it will also be more effective.

It is because of the above rationale that no attempt is made here to compare the cost of proposed ITV systems with that of traditional teaching systems. It is conceded that ITV systems are likely to be more costly, but they also offer the potential to accomplish educational objectives beyond the reach of conventional systems.

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* Ibid., p. 97.

Method of Approach

The study was conducted in the period from April through July 1968. During May, four project team members visited 13 Latin American countries. The hazards to accuracy and comprehensiveness associated with field visits of only two to six days per country are acknowledged. However, the cooperation and advance planning of USAID missions provided extremely effective support to the field inquiries. In providing this support, the missions drew on their own capabilities and those of other units in the U.S. representation abroad, such as the Peace Corps, the U.S. Information Agency, and the embassy staffs. These representatives provided valuable current information to the project team and arranged for meetings with Latin American officials interested in the study. As a result, the project team was able to explore the subject on a collaborative basis with perhaps 200 Latin Americans who hold positions in ministries of education, development planning units, telecommunications agencies, universities, industrial training organizations, and private educational institutions of the various countries. The names of persons interviewed are included in the country trip reports contained in Appendix B. The cordial and creative assistance of these individuals is gratefully acknowledged. This report makes liberal use of many ideas that they contributed.

While the field team was in Latin America, a computer-based techno-economic cost model was developed at the SRI facility in Menlo Park, California. Latin American geographical conditions, population distribution, educational organization, and telecommunications networks were estimated, and variables were assigned where a choice will be necessary to determine system design.

When the field team returned from Latin America, the technoeconomic model was tested and modified several times to reflect the needs and conditions found to exist in Latin America. Many further refinements were still to be made at the time that this report was prepared.

Information collected on existing and planned educational uses of broadcast media was analyzed to determine patterns common to two or more Latin American countries. A master list of applications of ETV was developed.

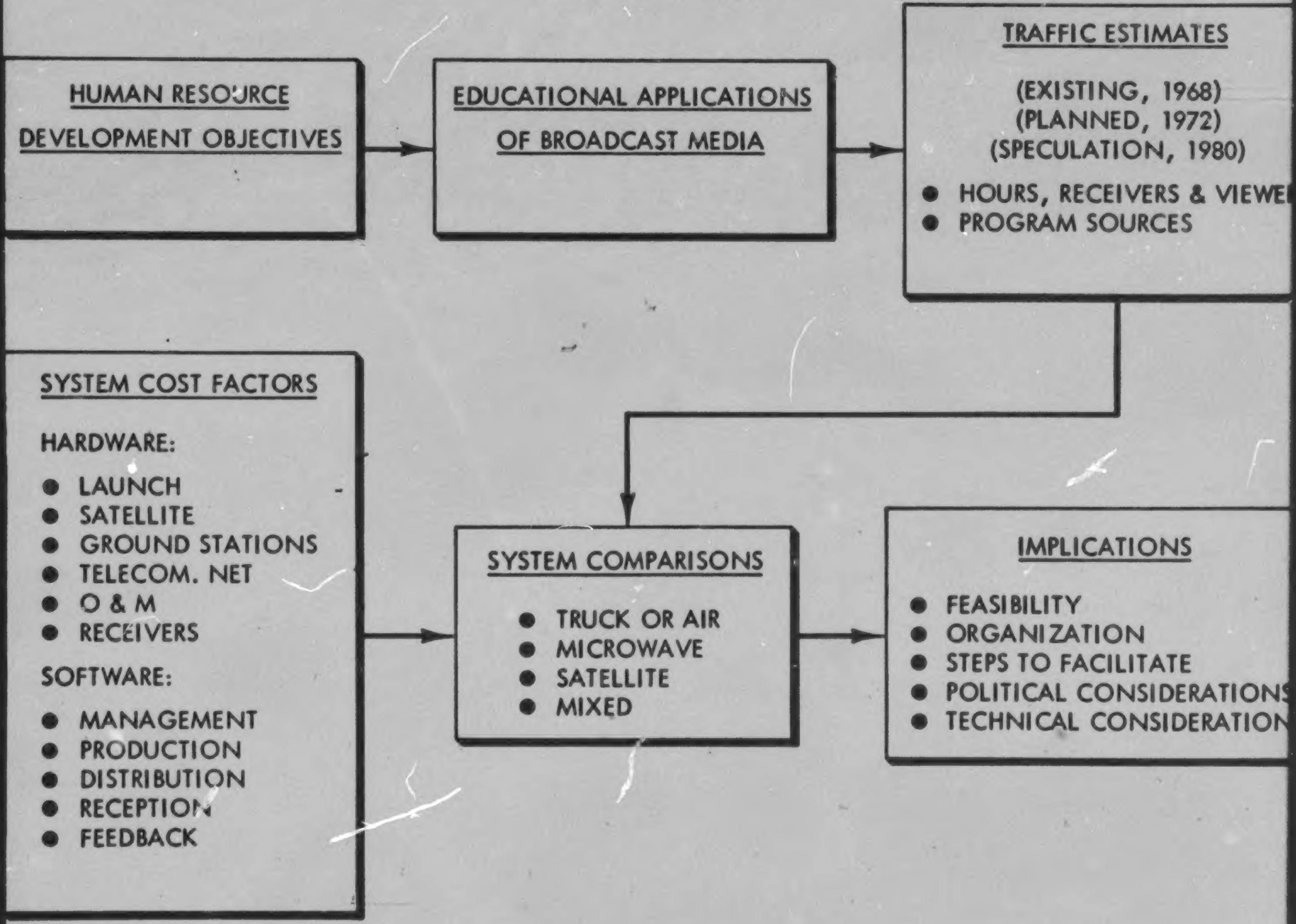
The logic of the Latin American study is presented in Figure 1. Education and training priorities were considered in the context of national and regional development objectives; opportunities for broadcast media to help achieve these human resource objectives were identified; estimates were made of the present and projected demand for such applications of media; preliminary system designs appropriate to the demand estimates were prepared, using alternatives of satellite and terrestrial delivery links; cost, feasibility, and organizational implications of the alternatives thus generated were estimated; and finally, a sequence of events in which satellite-distributed ETV might be introduced in Latin America was developed.

The project leader of the Latin American study was William J. Platt, Director of Manpower and Education Research at SRI. Co-authors of this report are Andrew J. Lipinski, Senior Research Engineer, SRI; Robert Schenkkan, Director, Communication Center, University of Texas; Emile McAnany, Institute for Communication Research, Stanford University; and Andrew D. Cohen, Research Analyst, SRI. Mr. Lipinski developed the

FIGURE 1

STUDY DESIGN

EDUCATIONAL APPLICATIONS OF A COMMUNICATIONS SATELLITE FOR LATIN AMERICA


HUMAN RESOURCE DEVELOPMENT OBJECTIVES
EDUCATIONAL APPLICATIONS OF BROADCAST MEDIA
TRAFFIC ESTIMATES
(EXISTING, 1968)
(PLANNED, 1972)
(SPECULATION, 1980)
● HOURS, RECEIVERS & VIEWE
● PROGRAM SOURCES
SYSTEM COST FACTORS
HARDWARE:
● LAUNCH
● SATELLITE
● GROUND STATIONS
● TELECOM. NET
● O & M
● RECEIVERS
SOFTWARE:
● MANAGEMENT
● PRODUCTION
● DISTRIBUTION
● RECEPTION
● FEEDBACK
SYSTEM COMPARISONS
● TRUCK OR AIR
● MICROWAVE
● SATELLITE
● MIXED
IMPLICATIONS
● FEASIBILITY
● ORGANIZATION
● STEPS TO FACILITATE
● POLITICAL CONSIDERATIONS
● TECHNICAL CONSIDERATION

technoeconomic costs model in collaboration with B. R. Stack, Senior Research Engineer. Professor William R. Odell, of the Stanford University School of Education, served as a consultant on educational organization. Professor Paul R. Hanna, with assistance from Janet Abrams, prepared the paper on the emerging Latin American community that appears as Appendix C to this volume.

II HUMAN RESOURCES DEVELOPMENT OBJECTIVES

The use of broadcast media in education is not an end in itself, but a means of facilitating the learning process. Accordingly, the first requirement in estimating needs for educational broadcasting is a knowledge of the human resources development needs--the priorities in education and training--of the country or region. After these needs have been identified, it is possible to analyze whether or not broadcast media have particular utility in helping to meet them.

In each country visited, education officials who are charged with planning and policy-making in education and teacher training were interviewed, and reports were obtained on plans for educational development. These interviews and planning documents were examined to determine common patterns of needs and priorities. These patterns are summarized in Table 1. A check mark in the country column indicates that an objective was stated to have high priority for the human resources development strategy of the country. A high degree of precision in characterizing the policy-makers' strategies of educational advance was not possible in the short time available for field work. Nor is precision in this step essential to the analysis being made. The goal of this analytical phase was only to establish the context of development strategy within which applications of television will later be considered.

Table 1

ANNOUNCED STRATEGIES OF HUMAN RESOURCES DEVELOPMENT IN LATIN AMERICAN COUNTRIES VISITED, MAY 1968

Objective	Argentina	Bolivia	Brazil	El Salvador (representing Central America)
1. Achieve universal access to primary education	x	x	x	x
2. Reduce wastage in primary education	x		x	x
3. Extend access to secondary education			x	x
4. Modernize secondary education structure and curriculum				x
5. Strengthen and rationalize vocational education	x	x		x
6. Strengthen occupational training			x	
7. Increase relevance of education to development needs	x			
8. Improve instructional materials			x	x
9. Use modern educational technology (e.g., programmed instruction, ITV)				x
10. Improve quality of teacher training			x	x
11. Modernize teacher and learning processes				
12. Initiate or strengthen educational planning, research, and evaluation				x
13. Strengthen educational administration	x			x
14. Consolidate basic offerings in higher education			x	x
15. Reduce wastage in higher education	x			x
16. Offer fundamental education in health, community development, and literacy	x	x	x	x

Objective	Chile	Columbia	Mexico	Peru	Uruguay	Venezuela
1. Achieve universal access to primary education	x	x	x	x		
2. Reduce wastage in primary education	x	x			x	x
3. Extend access to secondary education	x		x		x	x
4. Modernize secondary education structure and curriculum	x	x				x
5. Strengthen and rationalize vocational education	x					x
6. Strengthen occupational training	x	x		x		x
7. Increase relevance of education to development needs	x		x	x		x
8. Improve instructional materials	x	x	x			x
9. Use modern educational technology (e.g., programmed instruction, ITV)		x		x		x
10. Improve quality of teacher training	x	x				x
11. Modernize teacher and learning processes	x	x				x
12. Initiate or strengthen educational planning, research, and evaluation	x	x				x
13. Strengthen educational administration	x	x				
14. Consolidate basic offerings in higher education	x					x
15. Reduce wastage in higher education						
16. Offer fundamental education in health, community development, and literacy	x	x	x	x		x

Objective 1: Achieve Universal Access to Primary Education

Objective 2: Reduce Wastage in Primary Education

The officials of all Latin American countries studied believe that it is the obligation of the state to provide universal primary education. Few countries have been able to achieve these objectives. Obstacles have included the rapid rate of population increase; the shortage of teachers, particularly in rural areas; the shortage of classrooms; the need in rural areas for all citizens, including children, to assist in the peak load periods of the local agricultural cycle; and scarcities of public funds for education. Nearly all countries are gaining in the race between population and school enrollment, as is shown by the enrollment ratio, which is calculated by dividing the number of children in primary school by the country's population in the primary school age group. In the period from 1950 to 1963, this primary school enrollment ratio rose from 49 percent to 73 percent in Costa Rica, from 22 percent to 47 percent in Honduras, from 24 percent to 49 percent in Bolivia, from 28 percent to 50 percent in Brazil, and from 40 percent to 72 percent in Venezuela, according to the UNESCO Statistical Yearbook for 1965.

The overall figure for enrollment ratio masks wide differences between rural and urban schools and between established sections of urban areas and the rapidly growing fringe areas surrounding large cities (referred to in many ways, including barriadas, favelas, barrios, and ranchos). Many of the Latin American administrations are committed to improving access to schooling for people who live in these educationally disadvantaged areas.

The overall enrollment ratio masks another phenomenon common to nearly all developing countries: a very uneven distribution of enrollment by grade level within the primary cycle. This cycle varies in duration from four years (in Brazil) to eights years (in Chile), but in nearly every country the fraction of total enrollment represented by only the first two years is from 40 percent to 80 percent. This congestion at the first two grades is symptomatic of high dropout and repeater rates. A multiple-program attack on this problem is required: improved teaching, better nutrition for students through school breakfast or lunch programs, enforcement of child labor legislation, more and better located schools, modernized curricula that are more relevant to development needs, and so forth.

In helping to meet the objectives of improving access to and reducing wastage in primary education, ETV can modernize the content of instruction; and it can accomplish this more rapidly for a widespread school system than the alternative of attempting to upgrade the ability of thousands of underprepared teachers who would have to master and present new development-oriented curricula. ETV, correctly programmed, can set in motion new classroom and teacher practices, moving the learning environment towards inquiry and problem-solving and away from traditional rote memorization. ETV can provide educational utility even before it becomes feasible to supply fully qualified teachers or fully equipped schools.

Objective 3: Extend Access to Secondary Education

Objective 4: Modernize Secondary Education Structure and Curriculum

Throughout the developing world, secondary education tends to be a neglected level. National administrations are struggling to meet their commitments to provide universal access to primary education. Universities, as the institutions that prepare the economic and political leaderships, have symbolic value and prestige, thus commanding resources and attention that are sometimes out of proportion to their contributions to economic development. But secondary schools, intermediate between primary and higher education, lack a constituency. Although in Latin America as a whole over 50 percent of the enrollment capacity at the secondary level is in tuition-charging private schools, public school capacity at this level is being expanded rapidly in most countries. At the same time, there is a movement toward consolidation into the large comprehensive high school, accompanied in some instances by a restructuring of the academic, technical, and commercial tracks. This movement is in advanced stages of planning in Colombia and Chile.

Broadcast media can be effectively introduced into the educational system as an accompaniment and a reinforcement to the structural changes that are taking place at the secondary level. The consolidation of smaller schools into larger units permits organizing classes and schedules for efficient utilization of televised courses. Television programming offers the opportunity to modernize course content in every school in which the program is received, as a substitute for the slow process of diffusion required for each teacher to master the new material sufficiently to present the content himself.

Objective 5: Strengthen and Rationalize Vocational Education

Objective 6: Strengthen Occupational Training

Traditionally, most Latin American countries have organized each type of vocational education--agricultural, industrial, and commercial--as an educational track apart from college-preparatory secondary education. Very few vocational schools are adequately equipped or staffed to give their students a good vocational preparation. It is not generally realized that vocational education is inevitably more expensive per student year than academic education because of the requirements for expensive shop or office equipment and for materials to be used in the instructional process. A good instructor, furthermore, can usually be retained only by paying salaries competitive with those offered by industrial or commercial employers. And in most Latin American countries, teacher pay is below that found in other modern sectors. Ministries of education face a dilemma in dealing with expensive vocational education, which appears quite ineffective in producing a level of proficiency suitable for securing jobs, even for the relatively small percentage of students who complete the cycle.

Institutions of considerable value in increasing the productivity of all middle-level manpower form a distinctive group of organizations for occupational training. An example is SENAI in Brazil. These are discussed later in the report in a section on Technical Training.

There may be some question as to whether broadcast media can be helpful in achieving objectives of vocational and occupational training. This type of instruction necessarily must incorporate the element of practice--that is, learning by doing. Industrial training directors, however, have found that instructional films can complement practical work experience. Through instructional films and televised programs, it is possible for the instructor and his students to observe equipment being operated correctly and obtain close-up views of key operations such as positioning of cutting tools, etc. Skillful program production and good camera work can permit every student to understand the processes being studied. Often, the vocational training school will be unable to afford all of the required equipment and personnel. Films and televised series can help to overcome these inadequacies.

Another advantage of television in these applications is the relative universality and neutrality of subject material. Skills in using office equipment are virtually the same in every country. Similarly, shop practices are quite universal. It would appear, therefore, that there should be no great obstacles to sharing programming in these subjects throughout Latin America. Vocational agricultural training will, of course, differ with cropping patterns and climatic conditions, but skills for industry and commerce at similar levels of economic development tend to be fairly universal.

Objective 7: Increase Relevance of Education to Development Needs

The governments of a growing number of Latin American countries have recognized the need to gear education more closely to future employment prospects. A way to start this process is to plan systematically for human resources development in the context of realistic economic development prospects of the country and the region.

In nearly every Latin American country there has been a serious effort to begin the process of human resources planning. In many cases, the impetus for this effort comes from the highest levels of government. In the public budget, the education sector usually claims the largest fraction of public expenditures. Scarce resources and competing demands from other sectors that may appear even more deserving of development have made it incumbent on budgeters and planners to look critically at the absolute amount and the composition of educational expenditures. In addition, external lending institutions like the Inter-American Development Bank, the World Bank, and the U.S. Agency for International Development are asking that comprehensive human resource development planning be a precondition for eligibility for loans in education.

Some Latin American countries have sought technical assistance in human resources planning. For example, Peru and Argentina obtained technical help from experts made available by OECD (Organization for Economic Cooperation and Development). Members of that 20-nation organization have for many years supported a collective effort in promoting new thinking and policies concerning the role that science and education can play in the economic growth of member countries. The potential offered by this planning movement is that of improving what economists call the consistency* of economic activities. Consistency, with respect to manpower, exists when the skills embodied in the work force at all levels of proficiency and attainment can serve as complementary inputs with other kinds of capital that will be available. And, of course, consistency can also be achieved by matching physical capital inputs in a complementary way to human capital inputs. But where inconsistency is found in this reciprocal relationship between human capital and physical capital, there is bound to be under-realization of economic potentials, with consequent underemployment and unemployment.

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* See Chapter 12 of Principles of Development Economics, by Henry J. Bruton (Prentiss-Hall, Inc., 1965).

The techniques of human resources development planning are by no means a complete science as yet, but their use promises to offer means of introducing greater rationality into selecting which investments should be made in expanding an education system. This can lead to the development of new policies for better retention of students and wider use of educational technology, such as ITV, for improving the effectiveness of education.

Objective 8: Improve Instructional Materials

Objective 9: Use Modern Educational Technology

Textbooks have been inadequate in quality and quantity in most Latin American countries. Ministries of education are now mounting vigorous programs to prepare and acquire modern instructional materials for widespread distribution. Two examples of textbook programs are those of Brazil and Central America.

In Brazil, there is a well-organized program to distribute 51 million textbooks over a three-year period, with textbooks to be free at elementary and secondary school levels and inexpensive at higher education levels. This program has been administered by a commission in which all parties having a direct interest in textbooks are represented, e.g., educators and publishers. The commission has established detailed policies for an equitable and rapid preparation, adoption, and dissemination of books. The Brazilian government has received technical and financial assistance from USAID in this program.

The countries of Central America are well along in a cooperative effort to improve the quality and quantity of textbooks available in this subregion. Here, machinery has been set up for the common adoption of text books among several countries. Sometimes this is achieved through minor variations in the editions distributed to various countries. At any rate, a much higher degree of uniformity of instructional materials applies now than before the joint program, and all countries have benefited from modernized and higher quality texts than they would have been able to afford individually. Again, the USAID program has offered technical and financial assistance.

In a few of the Latin American countries, personnel in ministries of education are devoting attention to technologically-based solutions to educational development problems. There is a growing realization that traditional approaches to education lack the energizing influence of human resources development necessary for more rapid national and regional development. This is part of the rationale that led the government of El Salvador to decide to undertake an ambitious and sweeping adoption of ETV at the secondary level.

Objective 10: Improve Quality of Teacher Training

Objective 11: Modernize Teaching and Learning Processes

Several Latin American educational administrators recognize that the key to advancement in education is that of improving teaching effectiveness. Where this objective has been given high priority in Latin America, there is a strong movement to consolidate the teacher training institutions into a smaller number of schools that will offer training responsive to modern theories of learning and educational psychology, and incorporate development-relevant course content.

C. E. Beeby, in his book, The Quality of Education in Developing Countries, seems to have identified the phenomenon that is occurring with respect to teaching and learning processes. It would appear that the countries in which Objectives 10 and 11 are being given high priority are now advancing to the stage of growth that Beeby refers to as "the stage of meaning." In the growth pattern he outlines, the traditional style of autocratic rote-teaching gives way to inquiry-oriented, problem-solving processes. Particularly in Colombia and Chile, leading educators and administrators see the essentiality of bringing problem-solving pedagogy to the classroom.

Educational institutions throughout the world tend to be conservative; therefore, the difficulty of introducing new practices is formidable. Traditional methods of teaching are the most comfortable. New approaches can be threatening, particularly for teachers whose preparation was weak or marginal. Nonetheless, educational administrators in Latin America have resolved to give these objectives high priority and allocate scarce resources to achieve them. The Ministry of Education in Chile, for example, has concluded that it must employ ETV as a means of inservice upgrading of the existing teacher forces. Ministry officials realize that conventional approaches to inservice retraining would require many years. It is possible that the use of television for inservice training can shorten this period.

Objective 12: Initiate or Strengthen Educational Planning, Research, and Evaluation

Objective 13: Strengthen Educational Administration

These objectives are on a different level from the end-use objectives in this listing. Administration, planning, research, and evaluation are all part of the organizational infrastructure that enables the system to operate. In several Latin American countries, ministry officials believe improvement in educational administration is a precondition to the achieving of any other improvements in education effectiveness. Ministries are undertaking to attain the objective of improved administration in a variety of ways, including the application of planning, programming, and budgeting techniques, and the training of future administrative personnel in leading institutions inside and outside the country.

A strong impetus to improve planning, research, evaluation, and administration comes from the desire of several Latin American governments to qualify for educational loans from external sources, such as the Inter-American Development Bank, the World Bank, and the U.S. Agency for International Development. These lending organizations encourage systematic planning and evaluation.

The objective of several ministers of education to improve administration is highly relevant to this study. Any advanced physical technology such as ETV, whether delivered by satellite or terrestrially, requires a correspondingly advanced social technology for its management.

The administration of an ETV system is complex. A total system plan must be developed, and done so with some representation by key participants, such as classroom and television teachers, school principals, and subject matter specialists. Studio personnel must be obtained and oriented to the particular demands of producing instructional programs. Classrooms must be selected and equipped. Instructional material to accompany each lesson must be prepared. Teachers' lesson guides must be prepared and tested. The guides and materials must be scheduled to be available locally at convenient viewing times, and a thoroughly reliable delivery system must exist. Classroom teachers must be trained and motivated. A field staff for feedback from classroom to studio must be selected, trained, and equipped. All these and many other essential steps must be planned and executed with precision. Wherever a breakdown occurs, for example if teacher guides are not received before the program is to be viewed, the effectiveness of the system is drastically reduced. Thus, a high degree of administrative efficiency is an essential requirement in the use of television technology.

In Working Paper No. 5 in Volume IV of this report series, Dr. Benveniste discusses how ministries of education seldom have effective administrative capability. Yet if a ministry of education is to adopt complex technology, it must somehow overcome this shortcoming.

To the extent that a satellite-based education system uses common educational programs among several countries, the software administration problems are compounded. Representatives of sovereign countries must reconcile their views to agree on common programs, time-sharing of the satellite capacity for domestic programming, cost-sharing of common hardware and software, policing the free reception of a neighbor's domestic programming, and hundreds of other issues that will come with the planning and operation of a complex multinational system.

Objective 14: Consolidate Basic Offerings in Higher Education

Objective 15: Reduce Wastage in Higher Education

Many institutions of higher education in Latin America, like their corresponding institutions in Europe and the United States, remain citadels of academic conservatism. The widespread "catedrático" system of the tenured (and often absent) chaired professor tends to resist change and to preserve the autonomy of each professional school within a university. This system also permits a continuing proliferation of specialized schools, many of which are too small to offer quality education.

In several Latin American countries there are stirrings of reform within traditional programs. An objective shared by several institutions and administrators is that of improving the quality and efficiency of higher education by forming institutes, or departments, for each of the basic subjects within the larger universities. The institutes so formed would reduce the duplication of many basic courses (Chemistry I, for example, which is now offered in several faculties, or schools, with inconsistent standards, quality, and coverage). The reorganization into institutes facilitates transfers within the university, from one university to another, and from a domestic institution of higher education to foreign institutions, for study abroad. Science and technology courses, particularly the basic cycles at higher education levels, are often the first candidates for the adoption of new organizational structure. Science and technology are logical choices, in that high quality teachers and expensive technical equipment are required for demonstrations and expert presentation of technical content to a maximum number of students. Broadcast media seem to offer some effectiveness in the objective of making higher quality instruction widely available.

In nearly all Latin American universities, the number of student years required to produce a graduate far exceeds the number of years normally associated with the particular cycle. In Argentina, to cite a case that is representative of several Latin American countries, it takes 23.1[*] student years, instead of the normal five or six, to produce a university graduate in science or technology. This wastage is a burden both for the individual and society. It results from high dropout rates and large numbers of repeaters. A number of Latin American countries are seeking to identify underlying causes of this wastage and to institute corrective measures.

Objective 16: Offer Fundamental Education in Health, Community Development, and Literacy

In most Latin American countries, some increased attention is being given to the needs for adult education in both rural areas and the rapidly growing urban areas. In no countries was this topic accorded highest priority on the human resources development agenda, but it is being given more prominent concern than it had been several years ago.

Many education administrators in Latin America have studied the experience of private education groups in fundamental education. The agency with the longest experience in this is Sutatenza, in Colombia, which has served as a clearinghouse for similar efforts elsewhere in Latin America.

It would appear that fundamental education in health, community development, and literacy is now in a transition period in several respects. Efforts are being made to integrate literacy training with specific kinds of development-oriented course content, such as nutrition or family planning. Also, there is a growing interest in utilizing television as a means of reaching more people.

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[*] Education, Human Resources and Development in Argentina, Organisation for Economic Co-operation and Development, Paris, 1967, p. 450.

III EDUCATIONAL APPLICATIONS OF TELEVISION

Table 2 presents a master list of ETV applications, based on an inventory of existing and planned uses of ETV in Latin America and other developing countries. It is also designed to include applications that are potentially responsive to one or more of the objectives for human resources development in Latin America that were discussed in the preceding section. The purpose of the following discussion is to explain each application identified in Table 2 and to describe existing and planned use of these applications in Latin America.

Several broad distinctions are made throughout this discussion, and to avoid confusion, several terms should be defined. Organized reception refers to viewing of a televised program in a group controlled by a supervisor, teacher, or monitor. The place of reception may be either a regular classroom arranged for television viewing or a special telecenter. Unorganized reception refers to viewing in the home or in other unsupervised settings. The supervisors are referred to by various titles, including TV-utilization teachers, monitors, and leaders. Those teachers who perform on television are referred to as TV or studio teachers. ETV is used to encompass all efforts in education through television, while the term ITV is limited to activities carried on in an organized reception situation and assumes the use of accompanying instructional materials.

The major distinction drawn between core and supplementary curricula is that in a core curriculum, the televised programs provide the essential

Table 2

EDUCATIONAL APPLICATIONS OF TELEVISION IN LATIN AMERICA

Level	Code	Application
Adult	1.1	Fundamental rural education
	1.2	Rural forum
	1.3	Fundamental urban education
	1.4	TV-primary
	1.5	TV-secondary
	1.6	Public information
Teacher training	2.1	Preservice training
	2.2	Inservice training
Primary	3.1	Head Start and kindergarten-supplementary
	3.2	Primary-core
	3.3	Primary-supplementary
Secondary	4.1	Secondary-core
	4.2	Secondary-supplementary
Technical training	5.1	Vocational-agriculture
	5.2	Vocational-industrial and commercial
Higher education	6.1	Science and math
	6.2	Lecture series
	6.3	TV-college
	6.4	Continuing medical
	6.5	Continuing engineering

content in the course, while in a supplementary curriculum, the programs provide material to complement other instruction and are aimed at enriching the student's learning process with visual aids.

Core programming is broken down still further into comprehensive core and selective core. In the first case, all the courses taught to the student are taught through televised instruction. In the second case, only certain courses are taught by television. For example, a comprehensive core program will have all subjects televised, while a selective core program may broadcast geography and general science, but not math, social studies, or music.

The current use of these ETV applications in Latin America and plans and potentials for their future utilization are discussed below.

Adult Education (1.1-1.6)

Latin American education officials are becoming increasingly aware of their responsibility to provide educational opportunities to adults. The task is not an easy one, because adults vary so greatly in age and previous educational achievement.

Latin American educators have turned to mass media as a means of helping to develop potential among adults. For 20 years, Radio Sutatenza of Colombia has broadcast programs of formal and informal adult education. Its major aim has been to bring to the people of rural Colombia new incentives for work and for use of leisure time. Numerous other Latin American countries, such as Peru, Bolivia, Venezuela, and Honduras, followed this example and set up educational radio programs.

With the advent of television, a shift from radio to television is beginning in adult education. As could be expected, the initial programming has been directed toward urban education, largely because of convenience. Transmitters linked by microwave now serve primarily urban areas, and almost all of the television sets in operation are located in urban homes, factories, meeting halls, and city schools.

Brazil, for example, currently provides an accelerated secondary school course for Rio viewers. Peru has several small scale televised adult education programs for viewers in and around Arequipa and Puno. There has been some effort to expand these programs gradually to the more rural zones. In Mexico, a secondary school television program is provided to meet the needs of secondary-age students in areas with no secondary schools. As a by-product, several thousand adults are viewing this program in their own homes or elsewhere.

Existing Applications of Television

1.1 Fundamental Rural Education

1.3 Fundamental Urban Education

The advancement of literacy generally has been the starting point for adult education by media, although programs on health, agriculture, civics, and community development may be integrated into the curriculum. This is the pattern that the Catholic priests--the innovators in this field--have established. Literacy is generally regarded as a necessary tool in the education process.

Radio Sutatenza of Colombia has been the pacesetter in its 20 years of broadcasting and, over the years, has served as a model for other Latin countries. At present, the station is considering the switch to television, but is waiting for low priced transistorized television sets to appear on the market. Most of their membership are in locations without electrical power.

The new Colombian televised urban education program, Capacitación Popular, will have its third and final test run in closed circuit during August 1968 and then will broadcast on open circuit to selected telecenters in the major urban areas of Colombia. These areas are to be serviced by programs transmitted by new local channels to be established in Bogotá, Medellín and Cali. Since more than half of Colombia's population are urban dwellers (52 percent in 1964), it is felt that a sizeable number of illiterates can be reached. The first semester of the program will concentrate on literacy, and the second semester will integrate hygiene, home economics, community development, civics, and religion into the instructional material. There are also plans to teach basic mechanics and carpentry.

On the basis of feedback from research, the planners have tried to build into their program some provision for self-instruction outside of classroom hours. Studies have also been made to determine convenient hours for this type of programming and to develop an effective promotional program.

Television sets in rural areas have served more as attention-getting devices than as disseminators of fundamental rural education. The commerical program draws people to the set, and then, following the program, they are led in discussions about agriculture, health, and community development. This is the case in Peru and Colombia, for example. Several teleclubs were set up in the rural areas around Arequipa, but so far there have been no rural education programs televised. The same approach has been used in 28 of the 32 nucleo-schools in Colombia. In the evenings, the television sets are turned on to bring adults to the schools. After television viewing, discussions are held on topics such as agriculture, home economics, and health. Here, reading and writing are taught to adults in the evenings, using many audiovisual aids other than television; television is used only for recreation.

The Catholic priests in Puno, Peru, have a most ambitious plan for ETV that calls for eight different applications of television. Among these is a plan for televised agricultural education, to include practical demonstrations for campesinos. They expect each of the districts of Puno interested in participating to build their own community center, buy a generator, a television set, and possibly a transmitter. These agricultural programs will be broadcast outside of regular school hours. Also, there is talk of sharing some of these programs with Bolivia.

Mexico City and Lima both have TV-fundamental education programs that are devoted to the rudiments of literacy. In Lima, 35 telecenters in the barriadas receive these programs. In Mexico, the basic literacy programs are broadcast to a much larger group. The same program is also broadcast by radio, although it goes for five months rather than four.

In Mexico, teaching by television will shift in some areas to film teaching, because television does not always reach important zones. Where there is television, people crowd into city halls, churches, and other buildings--sometimes 250 at a time--to view the programs. Books are distributed free, but students must register for them.

Mexico's National Productivity Center is doing some experimental work on instructional material on the world of work for the television viewer. The purpose is to illustrate simple concepts of productivity through work simplification and industrial safety. These films will generally run for one minute and will be shown in a manner similar to television commercials.

Brazil has several programs in fundamental urban ETV. In Rio, there is a fairly new literacy program. In Pôrto Alegre, a television group has produced two programs, one on electricity and one on mechanics. These programs are intended to provide pretechnical or prevocational education in these fields, with the hope of stimulating interest in further study. In Recife, televised health programs have been broadcast on a pilot basis.

1.2 Rural Forum

There appears to be nothing at the present in Latin America that compares with India's model of a rural radio forum. Radio Sutatenza and Radio Puno have programs that approach the objectives of a radio forum, as far as dissemination of agricultural information is concerned, but there is no attempt to reach both literates and illiterates in community discussion groups. Neither is there any regular feedback mechanism to permit farmers' questions to be broadcast and answered.

1.4 TV-Primary

1.5 TV-Secondary

TV-primary and TV-secondary generally refer to programs specially tailored to the more mature needs of adults. Usually two years of study are condensed into one. These courses are presented at hours that are most convenient for the adult population, namely early in the morning and in the evening.

Most efforts in this field have their roots in radio education. Brazil has been working with accelerated secondary education through a program referred to as Article 99. It is now being broadcast from Rio by the Brazilian Center for ETV, which was established in January 1967. El Salvador has an accelerated primary school program along similar lines, although these classes are intended as follow-up for recent literacy graduates. The Salvadoran experiment has not moved from radio to television, as has the Brazilian program.

TV-primary and TV-secondary courses, which proceed at the normal school pace and which are broadcast during school hours to regular classrooms or to specially designated viewing halls, also serve some elements of the adult population. They are open-circuit, and the public at large is free to watch. In Mexico, for instance, it is estimated that several thousand people follow the TV-secondary classes from their homes or from other places during the day. Those who follow the course from outside controlled classrooms enroll for the course on an individual study basis and receive credit if they pass the final exam.

There are also adults, some in their forties, who regularly attend the daily sessions in the established telecenters.

1.6 Public Information

Public information broadcasting lends itself more to unorganized viewing, while the foregoing applications of television call for organized reception, either through classroom supervision or through correspondence studies.

Public information includes local, national, and international news events, and sports events, as well as theater, concerts, and lectures of general interest. Few programs of this nature are broadcast regularly on commercial networks, since commercial stations believe that there is a lack of public demand for such offerings. However, the same Brazilian Center that produces the accelerated secondary program, Article 99, has been transmitting cultural programs, including roundtable discussions.

Potential for Future Applications of Television

1.1 Fundamental Rural Education

The potential for rural television is only as great as the capability of providing stimulating, locally-directed programs at the village level. So far, television has not been successful in reaching rural areas. The terrain has not lent itself to extensive microwave connections, and often maintenance has been inadequate. But given some alternative means of transmission (perhaps through direct broadcast from a satellite), television could provide new lifeblood for rural communities.

Certainly television cannot take the place of extension agents. But only too often there are not enough extension agents to begin to cover the vast rural areas in countries such as Peru and Bolivia. Television could at least provide some information at the local level. Perhaps a school teacher or a duly-appointed community leader could act as monitor in cases of possible misunderstanding. The message would have to be local in content and directed at only certain elements of the population at any one time.

For instance, one message could be specifically aimed at youth, who are inclined to leave the farms in search of work in the cities. In fact, rural television programs might help to curtail this youth-drain. Emphasis could be placed on applications of modern technology to the rural setting. In Bolivia, for example, these youths, (ages 16 to 25) usually have from three to six years of schooling, and so they are more accustomed to the formal educational system than their parents. The content of programs, therefore, may well call for a more sophisticated approach than that planned for adults. Television could be integrated into existing 4-H programs, or even into sports clubs. If no such clubs exist, clubs could be formed expressly for television viewing. Such teleclubs have been formed in Arequipa, although no special rural programming has been available to date.

The adult population would be more likely to need elementary programming, using simpler concepts and with more reinforcement by a monitor at the local level. It also may be necessary to broadcast such programs in the indigenous language.

Both for youths and for adults, programs would be most meaningful if they could originate out of local agricultural experimental stations or from similar locations. These stations do exist. In fact, Puno, Peru, has an experimental farm that could well serve as a model for the entire altiplano of Peru and Bolivia. The potential for television coverage, however, has as yet not been tapped. Some villagers only several miles away are totally unaware of the operation.

There is also potential at the village level for programs that an extension agent would have difficulty presenting. For example, the concept of preventive medicine is difficult to teach, unless local villagers can see with their own eyes the cases of disease that have afflicted animals. There could be lectures on animal husbandry and veterinary medicine given by a veterinarian (of which there may be very few in the country).

To take another situation, television could present educational topics of a delicate nature that an extension agent might not wish to attempt. Over television, a well-known doctor could discuss family planning, for instance, with documentary films and other visual aids. Such a program could conceivably have greater instructional value than a direct presentation.

One further potential for television in fundamental rural education would be that of inservice training for the various extension agents in agriculture, health, and nutrition. Although this application may appear small in scale, the multiplying effect could be enormous. For each extension agent who becomes better informed, there could be many villagers so enlightened. Furthermore, rural television programs aimed at extension agents may help to sustain their interest in living and working at the village level.

1.2 Rural Forum

Potential exists for televised rural forums similar to India's Radio Rural Forum, even though there have been no experiments in this field in Latin America. At the end of 1965, India had 12,776 forums in operation. These forums try to attain a two-way communication between the broadcasting station and the village. Each listening post sends questions and comments to the station to be answered during the next broadcast. Thus, there is feedback for farmers on questions concerning planting, purchasing of farm equipment and chemical fertilizers, and other steps toward community improvement. It is noteworthy that the degree of participation in radio forums has not been at all dependent on literacy. This finding suggests that perhaps more time should be spent in rural forum activities and less in formal literacy instruction. Whereas literacy might not be long-lasting enough to be of significant help to the farmer in the duration of his life span, two-way communication concerning farm matters might affect an entire harvest or an entire year's income.

1.3 Fundamental Urban Education

The urban sector provides a more natural setting for production of fundamental education than does the rural sector. Microwave nets connect many of the urban centers of Latin America and will cover many more in the near future. And television sets are more available and more easily maintained. Increasingly large sectors of the urban population, even the poorest slum dwellers, are now viewing television. Thus, there is great potential for utilizing television in fundamental urban education.

The urban group with perhaps the most pressing educational needs is composed of those who have recently arrived from rural areas. Some Latin Americans refer to this group as "rururbana."

These new urban dwellers often come unprepared to meet the demands of the urban labor market. They require new skills to aid them in becoming assimilated. Often, literacy is a prerequisite to employment. Television may provide a stimulating, rapid means for its attainment. Mexico, Brazil, and Colombia are putting this notion to the test. Although no rural-urban comparisons have been published, Bolivia's Radiofónica experience suggests that urban literacy campaigns produce more graduates per number of registrants than do rural campaigns. There are not the interruptions of planting and harvesting. Also, since a pupil living in the city can more easily see a practical application for his new skill, there is greater motivation to complete the classes.

ETV also provides great potential for teaching other urban skills, such as basic carpentry and mechanics. These skills can be taught to literates and illiterates alike, as can good health and nutrition.

1.4 TV-Primary

1.5 TV-Secondary

There are many adults who desire more substantive education than that which is provided in fundamental education courses. Their available hours are few, but their increased maturity permits them to absorb more material than a pupil within the normal school age group. Accelerated courses have provided a solution to these adult needs. The potential for television in this area would be as a visual aid to permit the adult to absorb the material more rapidly.

Furthermore, such accelerated programs, especially at the primary level, can serve as follow-up to literacy courses. This approach is already being tested by radio in El Salvador, and there is thought of putting the programs on television. All Latin countries that have on-going literacy programs could provide accelerated primary classes as a follow-up to successful completion of the literacy program. Currently, one of the major criticisms of literacy programs is that they have no provision for follow-up work to utilize the newly acquired literacy skills.

In the area of accelerated secondary education, Brazil is demonstrating through its Article 99 that several years of secondary school can be packaged into a one-year course to be broadcast on television. The notion of speeding up the acquisition of knowledge at the secondary level is a potential means of stepping up the training of adults. Thus, even higher education would not seem so remote to the adult primary school graduate.

1.6 Public Information

Public information is an area with great potential for television. If a satellite is available to Latin America, it is most likely that the first common programming among countries will take the form of general news broadcasts or perhaps something more basic, such as a soccer match. Actually, the sports contest may be the only viable offering, unless some careful joint planning is done by a group of Latin countries.

The first and seemingly most ominous obstacle to hemispheric broadcasting is the threat of its use for transmitting propaganda. It would take a cooperative effort among cooperating nations to produce news broadcasts that are apolitical in nature, but certainly such an effort is within reasonable bounds. If news proves to be too difficult to neutralize, there are many programs in other areas that could be of common interest, such as folklore presentations, travelogues, documentaries, and animated instructional cartoons. The National Productivity Center in Mexico, for instance, could broadcast its short films on thrift, industrial safety, and work simplification. Unquestionably, such programs would not presume to meet local needs on any great scale, but this still leaves great latitude for common broadcasting.

Until now, commercial stations have offered old U.S. films, local serials, variety shows, and sports. These programs are viewed by surprisingly large numbers of Latin Americans, often in disproportionately large groups around single sets. Business Week (June 17, 1967, pp. 86-88) reports that while only 3 million of Brazil's 85 million people own television sets, an average of 3.5 viewers per 100 (as compared with 2.0 in the U.S.) watch television from noon until late at night. These figures reflect the ever-increasing tendency for slum dwellers to be television viewers, whether through purchase of a set (even though their meager incomes should make such a purchase prohibitive) or through crowding around someone else's set. Television undoubtedly serves as an escape from their surroundings.

With such a large and attentive captive audience watching every offering, there is much potential for programs catering specifically to Latin American needs. It has been pointed out that the modern Los Angeles kitchen and the plush Fifth Avenue bathroom are not relevant to the needs and aspiration of the favela resident in Rio. Perhaps, over time, U.S. program imports could be phased out, as Latin American programs are upgraded.

One immediate possibility is that advertising should be more sensitive to the needs of the poorest citizens. Perhaps these advertisers could be prevailed on to prepare short educational films that would also sell their products. A pharmaceutical company, for instance, could produce a short on better health or hygiene and employing its products. A farm supply company might discuss the importance of good seeds and chemical fertilizer, or of a good tractor, for the planting season. Or an appliance company could suggest certain cooking utensils to make household chores easier. The emphasis could be as much on improving the standard of living as on selling a particular product.

There is special potential for Pan-American programs. Instead of relating to only one country, these programs would treat multinational themes and include a multinational cast. For instance, organizations such as the OAS or UNESCO could televise reports on their inter-American activities.

Many commercial stations feel that the ETV programs do not draw enough viewers to be productive. As a result, commercial broadcasters are reluctant to release time to ETV concerns--particularly prime time. Public information television may have the potential of bridging the gap between purely instructional and purely commercial television. However, such public information programs must be effective enough to win the respect of commercial people. Perhaps this calls for the participation of persons in both commercial and educational television.

Such ideas may seem remote to many struggling Latin American television stations. Yet in another 10 years, if not sooner, when their status is more firm, they might be ready to undertake such ventures.

Teacher Training (2.1-2.2)

Teacher training is being accorded increasing priority by Latin American education officials. In a few cases, the supply of teachers is far short of the demand, as at the primary level in Colombia. In other cases, the supply has met or even surpassed the demand, as in El Salvador, where the Salvadoran Ministry of Education is discouraging the training of new teachers by phasing out normal school operations. The number of these institutions has been decreased from 52 to 5 between 1967 and 1968, with the intention of consolidating all teacher training efforts at the new educational center, where the TV-junior-secondary program is produced.

Quality considerations in teacher training are now generally of greater importance to Latin American education officials than in the past. Educational reform programs, such as the ones underway in Chile and Venezuela, are stressing the need to teach a revised curriculum in a new way. No longer are teachers to adhere to the autocratic, rote memorization style of instruction, represented by drills and formalism. Instead, the approach will be one of problem-solving and inductive learning. The

Chilean Centro de Perfeccionamiento has prepared and is distributing teachers' manuals in new math and sciences for the 7th and 8th grades.

Such educational innovations, however, put a strain on the existing teaching staff. Credentials that were considered adequate are now being challenged. In Colombia, for example there is talk of standardizing requirements, which could threaten the positions of many teachers. Some teachers are lacking the general educational background necessary to enable them to adjust to new curricula and new teaching methods. However, the availability of television presents some interesting possibilities for upgrading the current level of teaching as well as training new teachers.

Existing Applications of Television

2.1 Preservice Training

The field team did not find cases of Latin American institutions that are now using television to deliver course material for preservice training. There are, however, preservice courses on the subject of television for people wishing to serve as TV-utilization teachers.

As of 1965, a television course became mandatory for all Colombian normal school students. This required course includes material on how television is used in the classroom and two years of internship as a TV-utilization teacher. Many of the 230 normal schools have a primary school annex in which the normal school students can practice television utilization. During the first year they serve as assistant TV-utilization teachers, and in the second they take charge of classes. The National Institute for Radio and Television in Colombia printed a special booklet for normal school students that outlines basic information for TV-utilization teachers.

In Brazil, Rio de Janeiro's Institute for Education (the largest teacher training institution in the State of Guanabara) has a 12-month course for primary and secondary teachers in television utilization that is chiefly built around the TV-secondary course, Article 99. This course serves as an introduction to television utilization. El Salvador, on the other hand, is already training TV-utilization teachers for their junior-secondary program, which begins in 1969. The initial phase of the program will include 100 TV-utilization teachers at 50 telecenters.

Venezuela has also been giving preservice television utilization training to teachers, but on a more abbreviated basis. The Ministry of Education's Audiovisual Division conducts a 15-day TV-utilization course before the broadcasting of the annual supplementary primary program. The emphasis is on the use of audiovisual materials in teaching.

The only program to date in preservice training through microteaching* is offered by the University of Javeriana in Bogotá, Colombia. Students in their third and fourth years at the Faculty of Education participate first in a special classroom set up at the University, then in the actual secondary school classroom.

2.2 Inservice Training

In the case of TV-utilization teachers, both Colombia and Mexico have televised programs on Saturday mornings. These programs provide weekly guidance on special problems and on general practice. In Colombia, these courses are directed at the primary school TV-utilization teachers. In Mexico, they are for the classroom monitors, who carry out the role of the TV-utilization teacher in Mexico's TV-secondary centers.

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* A trainee teacher's presentation to a small group of students is video taped for immediate replaying and self-evaluation.

Potential for Future Applications of Television

Considerable potential exists for additional use of television in teacher training, and the current plans of many Latin American education officials reflect an awareness of this fact.

Leaders in educational reform in Chile, for example, are hoping to meet their primary school teacher training needs through a countrywide television program. Some 55,000 primary school teachers (grades 1-8) require training in the new curriculum and in new teaching techniques. Since Chile now retrains only 1,200 primary teachers per year, it would take 45 years to retrain the whole force using the current system. Ministry personnel calculate that television could retrain these teachers in only four years. Furthermore, current retraining methods call for from six weeks to three months of training in a central institution, during which time the teacher would be absent from the classroom. Television training can be accomplished in several dispersed centers, while the teacher maintains at least part of his classroom load.

Rio de Janeiro's Institute for Education is also considering a television retraining course. Here, 30,000 teachers require retraining. The Institute's capacity is only 3,000 per year. Television broadcasts to the home are being considered.

It can probably be argued that teachers who have received part of their training by television are familiar with the medium and are therefore capable of becoming effective TV-utilization teachers. Some programs are even designed with this follow-up potential in mind. In El Salvador, for instance, the use of television to train primary school teachers is considered the first step in bringing television to the classroom. This is expected to lead to a comprehensive TV-primary program similar to the junior-secondary program now in the final planning stages. By 1971, some 4,000 primary school teachers are to receive 30 minutes of television instruction every afternoon at the 100 telecenters used by junior-secondary schools during the day.

To a great extent, the future of ETV in Latin America depends on the degree to which teachers understand that they can work more effectively with the medium than without it. Thus, if ETV is to win wide acceptance, there needs to be extensive use of the medium in all teacher training activities.

Primary Education (3.1-3.3)

In terms of magnitude alone, primary education is a major concern of government officials in Latin America. The number of primary-age school children far exceeds the capacity of existing schools. For those enrolled in schools, there is little motivation to remain. The curriculum is often obsolescent and the teachers uninspiring. Even if the student completes primary school, he may find that his primary education is not adequate to meet the standards of the select (and usually private) secondary schools, particularly if he comes to the city from a rural district.

Educators in Latin America have looked to television not only to increase the availability of education, but also to present instruction in a better-organized, more meaningful way. They see television offering a means of controlling, on a large scale, both the content of curriculum and the way it is taught. Although such use of television is relatively recent, several examples are discussed below.

Existing Applications of Television

Colombia has chosen to televise primary school education as extensively as possible. As a result, after three years of operation, its program is reaching 486,000 school children at 1,100 schools in the 9 most populous of Colombia's 22 states. The programs consist of a comprehensive core that covers all the subjects that are taught in the schools, from mathematics, music, and religion, to English and French. Ministry officials feel that televised instruction is a powerful tool for offering one well-balanced curriculum to all of the primary students within reach of the television signal and for training classroom teachers through the example of the television teacher. By their very nature, the programs engage the classroom teachers in new teaching techniques that entail student participation.

The coordinators of the Colombian primary program hope eventually to expand their efforts to encompass the entire country. Only one other ongoing primary program, the supplementary primary program of Venezuela, has similar plans for complete coverage. This program is transmitted from Caracas over a national network that reaches six other major population centers. In Caracas, 250 primary schools have receivers. Rather than provide core instruction, the programs present supplementary material to enrich the regular studies. These offerings are broadcast to priority levels at the primary level--kindergarten, fourth, and sixth grades--largely because limited finances do not permit broader coverage.

Venezuelan officials considered conventional kindergarten classes to be too academic for this impressionable period of a child's development. Children apparently were occupied by much copying of numbers into notebooks and were not exposed to more formative and active pursuits. Thus, the Audiovisual Center developed a kindergarten program that was first broadcast on open-circuit television in 1961. These televised programs combine activities such as singing and dancing with discussions of special interest to the age group. Many of the programs include film sequences. Each morning there is a different theme, concerning either people, places, and things at home and abroad, or simple introductions to curriculum through math and nature games.

Two additional supplementary presentations are intended to help to decrease the number of primary school dropouts. Fourth grade was chosen, because it was once the last year of primary school, and sixth grade was selected because it now is the final year. Venezuelan educators believe that special audio-visual attention at these crucial levels in their schooling may influence students to remain in school.

Televised primary education of a more local nature is found in Mexico and Peru. Monterrey, Mexico, has a selective core primary program for some 60 primary schools in the area. These schools receive world history, geography, and natural science through television. Arequipa, Peru, has provided a comprehensive core program to some 1,000 primary-age children not accommodated in the regular schools. This program resembles that of TV-primary for adults, because instruction is accelerated. Since the programs originate from Arequipa, there is an opportunity to incorporate local flavor into the presentations. The SRI team was unable to ascertain the current state of this program during the brief visit to the country.

Potential for Future Applications of Television

Other Latin countries are planning to begin their own primary school television programs in the near future. Uruguayan ministry officials are awaiting a shipment of television sets with which to initiate a pilot project that will reach 1,600 primary students in 40 schools. Initially, this program will transmit one selective core subject per day and will gradually expand. Personnel at Channel 11 in Recife, Brazil, hope to begin two primary school programs in the fall of 1968, one an accelerated program offering comprehensive core in three years instead of six, and the other a one-year primary school review for those lacking sufficient background to begin secondary schooling. Finally, El Salvador's ETV staff is contemplating the development of a TV-primary school program sometime in the early 1970s, after the junior-secondary program is well underway.

Colombia has been the trailblazer in TV-primary school education, and other Latin American countries have benefited from observing experiences there. Yet the primary projects underway or in the planning stages reflect diverse views regarding the role of television in the primary school classroom. It appears that television does not have blanket applications, but rather moulds itself to the needs of a particular country at a given time. For instance, the architects of the Eduplan Reform Program in Venezuela do not envision television as providing the main instructional message. They believe that the teacher must perform this task, aided by revised curricula, better textbooks, and adequate retraining. The use of television in this case is more for the diffusion of culture and as a general motivational force to maintain the child's interest in his studies.

In Mexico, the television set has not as yet been granted access to the regular classrooms. And in Peru and Brazil, TV-primary has often been transmitted specifically for primary-age children who are outside of the classroom and would otherwise not receive any primary education. This has also been the case at the secondary level in Mexico.

Potential for Multinational Cooperation

There is potential application at the primary level not only for national but also for multinational television programming. Different calendar years, levels of schooling, and methods of organizing curriculum are not so important at the primary level. In fact, American Samoa does not divide the first eight years into eight grades, but rather groups every two years together and provides courses by general content level.* While in this particular case a lack of well-defined curriculum and a language problem blurred the distinctions between years, grade distinctions are also unclear in the Latin American primary school systems. Thus, if sights are set on sharing ETV programming by educational level rather than specific grade, such collaboration in Latin America may become feasible. As for teacher participation, it is assumed that teachers are more flexible at the primary level than at any other since the subject matter is not rigidly divided.

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* Wilbur Schramm et al., New Educational Media in Action: Case Studies for Planners, Vol. I, "American Samoa," UNESCO, Paris, 1967, p. 28.

ODECA's Regional Textbook Program indicates Latin American nations are willing to share curricula at the primary school level. During the last five years, 30 educators representing the six Central American countries have been pooling their resources to produce basic texts for all subjects, including third and fourth grade social studies. The one exception to joint effort is the section of social studies entitled, "This is My Country." Here, each country provides its own material. Eight million texts have gone to press, and more are soon to be published.

Secondary Education (4.1-4.2)

Secondary education, long subordinated to primary education and higher education by educational administrators in most developing countries, is now beginning to receive attention and upgrading in some Latin American countries. Colombia and Chile, for example, are planning to establish new comprehensive high schools. Efforts are being made to extend access to secondary education to the growing numbers of primary school graduates. In El Salvador, officials are striving to raise the level of basic education from the sixth to the ninth grade. In Mexico, educators have plans to bring secondary schooling to certain areas for the first time. ITV is being used in helping to meet certain of these secondary school needs.

Existing Applications of Television

The only large scale secondary program in operation as of May 1968, was the telesecundaria project in Mexico. This program reaches some 13,000 students at the secondary school in 300 telecenters and offers the first of what is planned to be a three-year comprehensive core curriculum. (See the report on Mexico in Appendix B for more information on this project.) This program is modeled after Italy's Telescuola, which, in 1962, began to provide three years of core curriculum instruction for children in remote areas and in other areas without secondary schools. Monterrey, Mexico, has a secondary program of selective core science programs that is broadcast to schools in and around the area. And finally, during the three summer months, Venezuela has secondary courses in seventh- and eighth-grade math, Spanish, and English. These are intended as remedial courses.

Potential for Future Applications of Television

Although the list of ongoing programs is not extensive, plans call for broader application of television at the secondary level. El Salvador's TV-junior-secondary program, a pilot project resulting from the OAS Punta del Este Conference of April 1967, promises to be a model for subsequent secondary programs. (See Appendix B for details.) It is planned that, by 1972, 75,000 secondary school children will be reached--49,000 during the day and 26,000 at night--at a total of 2,150 telecenters. The program will provide three years of comprehensive core curriculum. All

Latin America is closely watching the progress of El Salvador's TV-junior-secondary experiment, and a success here may be an inducement to other countries to attempt something similar.

Channel 11 in Recife, Brazil, has ambitious plans for TV-secondary instruction, including both a two-year and a three-year program. The two-year program will provide sufficient vocational training so that the student will have the option of either going right to work with better than a primary school background or of entering the third year of the regular TV-secondary program. The three-year program is directed at preparing students for higher education.

There is potential to build television programs into structural changes taking place at the secondary level. For instance, Colombia is planning to establish 10, and eventually 19, large comprehensive high schools to provide an effective and diverse curriculum for all secondary students, whether or not they are preparing for college. These schools will consolidate and modernize smaller tracked facilities. A similar program is planned in Chile, where 20 or 30 regional education centers are to be established at the secondary level. These larger secondary schools that are serving students with diverse educational objectives would offer the potential for economical reception of televised science and mathematics instruction.

If the comprehensive high schools should incur problems of large numbers viewing at one time, the Hagerstown example may provide a working model.* Since Hagerstown found that as many as 300 students at a time would be viewing one televised program, they developed a system whereby smaller groups would meet for discussion immediately following the presentation.

The future of TV-secondary programs set up where no secondary schools now exist may parallel the experience of Italy. Italian officials of the Centro di Telescuola found that while in 1962-1963 there were 722 telescuolas, in 1965-1966 there were only 259. The decline was attributed to community progress. Road construction, in particular, decreased isolation and facilitated transportation of children to regular secondary schools.†

The Mexican officials of telesecundaria seem to foresee similar occurrences and, in fact, wish to encourage them in their ETV program. They suggest that once the telecenters are drawing large groups of students regularly and have attracted adequately prepared teachers, it will be possible to withdraw the television set and convert the center into a regular secondary school.

In some cases, a country develops a TV-secondary program only to find that the primary school background of those who attend is so poor that the students are not really ready to assume the responsibilities of higher level studies. The planners at Channel 11 in Recife, Brazil, have foreseen this problem and consequently intend to broadcast one full year devoted to review of primary school. They are aware that there must be articulation between primary and secondary education for there to be any real educational accomplishment. There is potential in many countries for televised review courses that improve the articulation between primary and secondary education and between secondary and college-levels as well.

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* Educational Media in Action: Case Studies for Planners, Vol. I, Hagerstown: "A Pioneer in Closed-Circuit Televised Instruction," p. 69.

† Ibid., "The Centro di Telescuola," p. 22.

Potential for Multinational Cooperation

Secondary education provides some prospect for sharing of programs by several countries. Two areas of subject matter that many Latin educators indicated as possessing good potential for sharing are those of science and mathematics. First, these subjects are as nearly culture-free as possible and pose a minimum threat to national sensitivities. Second, there is considerable interest in all countries in upgrading, or further modernizing, of instruction in these subjects.

Technical Training (5.1-5.2)

Technical training refers to organized efforts to prepare people to perform well in certain occupational roles. Professional education at the college level is excluded. Technical training is either received in regular school programs or in vocational schools (either public or private). Such training is also offered by specialized training organizations.

Two categories are distinguished within technical training, one for agricultural training (5.1) and one for industrial and commercial training (5.2). There is much more interest and instruction in the second area. Industrial and commercial training applications of television branch out into promotional courses for a particular training organization, usually pretechnical in nature, and remedial training courses for beginners in a technical field.

Technical training at the middle level of studies has had a varied role in the Latin American educational system. In some cases, this training has been part of the formal curriculum. In others, it has been relegated to special vocational schools. Sometimes students have been sent to such schools because of an inability to achieve adequate proficiency to proceed in the in the academic track.

An alternative form of technical training, used in Brazil since 1942 but common to other Latin countries since the late 1950s or early 1960s, is that of specialized training organizations. Most of this training is oriented to the need of industrial and commercial employers. These organizations are: SENAI and SENAC/Brazil, SENA/Colombia, INCE/Venezuela, INACAP/Chile, CONET/Argentina, SENATI/Peru, INA/Costa Rica, and SECAP/Ecuador. Such organizations are playing an increasingly prominent role in augmenting the productivity of middle-level manpower. Originally established through external technical and technical aid, most of these organizations are autonomous public corporations financed by a tax on the payrolls of employing establishments. Two exceptions are Chile's INACAP and Mexico's National Productivity Center, which are both financed through general funds of the governments.

Large numbers of people are trained by these organizations: for example, 71,000 per year in Brazil, 30,000 in Mexico, 80,000 in Colombia, and 90,000 in Venezuela. These figures do not include the many in-plant trainees who also participate. The training includes apprenticeship programs, special skill centers, and supervisory development courses. Assistance is also offered to other company training programs. While emphasis is placed on the training of employed workers, the training organizations are allocating a growing effort to pre-employment training of unemployed youths.

These various training organizations support a clearinghouse organization called CINTERFOR, which has offices in Montevideo. This organization convenes regional meetings and publishes bulletins on training activities.

To date, interest in televised instruction for technical training has been limited and is sponsored exclusively by special training organizations rather than by school systems.

Existing Applications of Television

Only three applications of television in the field of technical training are known to SRI. CONET, of Argentina, has prepared two courses that are being broadcast over open circuit and not on an organized reception basis. The general public receives these broadcasts at home, for 30 minutes each day. The main purpose of these courses is promotional. The programs are designed to stimulate interest in vocational training, so that out-of-school youth and adults will enroll at the CONET centers for formal training. Both courses are primarily of a pretechnical nature and are designed to orient people to possibilities for technical training.

Another ongoing use of television in technical training is in Pôrto Alegre, Brazil, again along promotional,pretechnical lines. Simple mechanics and electricity are presented, with the hope of stimulating people to come into the centers for vocational training.

INACAP, in Chile, offered a weekly television program in Valparaíso that was designed to recruit trainees to its center. The program met its objectives by doubling enrollments in courses offered in the Valparaíso area.

Potential for Future Applications of Television

Perhaps the most widely considered use of television for technical training is an indirect one. Organizational personnel look to television as a means of preparing candidates for training courses. SENA of Colombia, for example, is faced with providing remedial training for 7,000 apprentices at one time. The trainees require general education in language and mathematical skills before they can benefit from technical training. SENA officials are considering television courses as a way to meet this pretraining demand. Venezuela's INCE has also considered such an approach to remedial instruction. However, INCE personnel also have considered using television programs to relate theory to shop practice and to rapidly disseminate new technical information. In the case of actual shop instruction, they feel that televised programs are not able to offer the constant repetition necessary in learning vocational skills.

Only Chile's INACAP is considering televised programs related to the content of technical training. INACAP is exploring the possibility of offering a televised course in vocational skills for the electronics industry.

Since all of the training institutions are well-organized and have voluntarily established clearinghouses through which to maintain a loose network of communication, there may be potential in this system for sharing commonly-produced television programs. This communication net of institutions is not found among other educational or training institutions in Latin America, with the possible exception of CUSUCA in Central American higher education.

Higher Education (6.1-6.5)

Five applications for television in higher education are identified. The first, science and math (6.1), includes fundamental college courses in physics, chemistry, biology, perhaps geology, and introductory mathematics. Lecture series (6.2) are programs in which visiting professors and other individuals speak on general topics relevant to the pursuits of college students. TV-college (6.3) is for those who are not able to proceed through the formal university system, but who would like to follow televised courses at home or at other reception centers. Continuing medical (6.4) and continuing engineering (6.5) refer to special programs designed to bring word of the latest innovations in medicine and engineering to practicing professionals.

The annual rate of enrollment in Latin American universities increased by 8 percent between 1955 and 1966, marking a greater increase than in the United States during the same period.* This growth is attributed to the expanding urban populations, the increasing income of the urban middle class, and the growing awareness that university study provides better economic and social opportunities. Such rapid growth in university enrollments has prompted education officials to give increased attention to television and its possible role in bringing course material to large numbers of students at one time.

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* Vision, May 24, 1968.

Existing Applications of Television

Currently, televised course instruction at the university level is not extensive, and broadcasting is primarily through closed-circuit operations. In Mexico, for example, two institutions of higher education produce television programs. The National Polytechnical Institute in Mexico City broadcasts basic courses for engineers for six hours each day. Institute officials state that without the televised courses, teachers would be required to repeat the same material 10 times or more to meet the demand of the engineering enrollment. Through television, 2,000 students may view the same program simultaneously in 10 different rooms. The Monterrey Institute of Technology transmits chemistry, psychology, and English to 400 students at a time in 10 classrooms. The programs are also shown at the Guaymas campus through video tape. (See Appendix B for details on other Mexican projects.)

A few Latin American universities are establishing schools of communications that offer special degrees in radio and television. A number of the schools of communications also transmit, on a small scale basis, closed-circuit instruction to classrooms within their respective universities. Examples of these operations are found in the University of San Salvador in Buenos Aires, the University of Javeriana in Bogotá, the University of São Paulo, and the Iberoamerican University in Mexico City.

The University of Javeriana is doing experimental work in teaching biology through closed-circuit television. In addition, the University is experimenting with possible ways of teaching surgery through video tapes of operations and is thinking of using color television to make the presentations more instructive. Television is also being used in a microteaching program. The Iberoamerican University has completed a 60-program series on "The History of Culture," which it transmits to 53 classrooms.

Potential for Future Applications of Television

Venezuela's University del Oriente is planning to broadcast fundamental science and mathematics through video tape to its four campuses, including the Faculties of Medicine, Engineering, Agriculture, and General Studies. University officials see potential for blanketing all of the faculties with the same basic science and math courses, to eliminate duplication of teaching efforts. Section II of this report describes a movement in Latin America towards the establishment of institutes, or departments, that will present basic subject matter to the entire university. The University del Oriente's plan of televised courses in basic subjects illustrates the institutional change now in process.

There remain other applications for television at the level of higher education. There is a potential, for instance, for lecture series by distinguished local or international professors. There is also potential for university broadcasts over open circuit to practicing professionals, such as doctors and engineers. These programs could treat innovations in the field to help keep these professionals up to date. Finally, there is a need for basic college courses among those who are outside the formal system but who wish such training. TV-college could be presented through correspondence courses viewed in the home or through organized reception at telecenters. In the United States, this type of program is offered in Chicago's University of the Air.

IV DEMAND PROJECTIONS

Estimates of Demand, by Country

Tables 3 through 12 present estimates of demand, by country, for each educational application of television defined in Section III. The objective of the analysis reported in these tables is to determine the following key requirements that must be specified for each alternative ETV delivery system:

- Number of television channels--a function of hours transmitted
- Receivers required
- Viewers (students) reached
- Program sources (whether national or regional)

Once these requirements have been determined, it is possible to calculate the hardware and software requirements, and their associated costs, of alternative ETV delivery systems.

Some explanation of the table column headings will clarify the development of the demand estimates.

Three estimates are presented. The estimate for 1968 is an attempt to inventory existing use of ETV, in each country, including closed- and open-circuit television. The second estimate, for 1972, is a fairly optimistic near-term extrapolation of existing applications. In 1972, figures reflect whatever officials stated as their plans for expansion of existing or specific new applications, whether or not budgeting and appropriations for such plans were firm. Thus, these figures are probably more properly

Table 3

CENTRAL AMERICA ETV DEMAND, 1968-80

		Hours Transmitted							
		1968			1972			1980	
Educational Application of TV	Application Code*	Morning	Afternoon	Evening	Morning	Afternoon	Evening	Morning	Afternoon
Adult	1.1-1.5	--	--	--	--	--	--	--	5.0
	1.6	--	--	--	--	--	--	--	--
Teacher training	2.1	--	--	--	5.0	5.0	--	10.0	10.0
	2.2	--	--	--	--	5.0	--	--	1.0
Primary	3.1	--	--	--	--	--	--	2.5	2.5
	3.2-3.3	--	--	--	1.3	1.3	--	8.5	6.5
Secondary	4.1-4.2	--	--	--	10.0	--	10.0	15.0	--
Technical training	5.1-5.2	--	--	--	--	--	--	5.0	5.0
Higher education	6.1	--	--	--	--	--	--	10.0	5.0
	6.2	--	--	--	--	--	--	--	--
	6.3	--	--	--	--	--	--	--	--
	6.4-6.5	--	--	--	--	--	--	--	--
Totals		--	--	--	16.3	11.3	10.0	51.0	35.0
TV channels					1			3	

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* See Table 2 for breakdown of application codes.

Eve-ning	Receivers (R) and Viewers (V) 1968 R	1968 V (000's)	1972 R	1972 V (000's)	1980 R	1980 V (000's)	Total Hours Distributed	Local Hours Generated	Externally Generated, 1980 Hours Received	Source
5.0	--	--	--	--	200	10.0	10.0	10.0	--	
5.0	--	--	--	--	--	--	5.0	2.0	1.0 1.0 1.0	Mexico Colombia Venezuela
--	--	--	20	0.6	70	7.6	20.0	20.0	--	
--	--	--	--	4.0	--	4.4	1.0	1.0	--	
--	--	--	--	--	550	33.0	5.0	2.5	2.5	Venezuela
--	--	--	200	3.5	3,850	693.0	15.0	8.0	3.0 2.0 2.0	Mexico Colombia Venezuela
10.0	--	--	3,500	100.0	4,725	240.0	25.0	15.0	4.0 3.0 3.0	Colombia Mexico Venezuela
--	--	--	--	--	20	2.0	10.0	2.5	2.5 2.5 2.5	Colombia Venezuela Mexico
--	--	--	--	--	40	4.0	15.0	8.0	3.0 2.0 2.0	Mexico Colombia Venezuela
--	--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	--	
2.0	--	--	--	--	--	2.0	2.0	0.5	0.5 0.5 0.5	Mexico Colombia Venezuela
22.0	--	--	3,720	108.1	9,455	996.0	108.0	69.5	--	

Table 4

MEXICO ETV DEMAND, 1968-80

Educational Application of TV	Application Code*	Hours Transmitted							
		1968			1972			1980	
		Morning	Afternoon	Evening	Morning	Afternoon	Evening	Morning	Afternoon
Adult	1.1-1.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
	1.6	--	--	--	--	--	--	--	--
Teacher training	2.1	--	--	--	--	--	--	10.0	10.0
	2.2	--	2.0	--	--	--	--	--	2.0
Primary	3.1	--	--	--	--	--	--	2.5	2.5
	3.2-3.3	5.0	--	--	5.0	2.5	--	0	0
Secondary	4.1-4.2	10.0	--	--	15.0	10.0	--	15.0	10.0
Technical training	5.1-5.2	--	--	--	--	--	--	5.0	5.0
Higher education	6.1	10.0	5.0	--	10.0	5.0	--	10.0	5.0
	6.2	--	--	--	--	--	--	2.5	1.0
	6.3	--	--	--	--	--	--	--	5.0
	6.4-6.5	--	--	--	--	--	--	--	--
Totals		27.5	9.5	2.5	32.5	20.0	2.5	47.5	43.0
TV channels					2			3	

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* See Table 2 for breakdown of application codes.

	Receivers (R) and Viewers (V)								Externally Generated, 1980	
	1968		1972		1980					
Eve-ning	R	V (000's)	R	V (000's)	R	V (000's)	Total Hours Distributed	Local Hours Generated	Hours Received	Source
2.5	1,000	50.0	2,000	100.0	2,000	100.0	7.5	7.5	--	
5.0	--	--	--	--	--	--	5.0	2.0	1.0	Central America
									1.0	Colombia
									1.0	Venezuela
--	--	--	--	--	25	2.5	20.0	20.0	--	
--	--	0.4	--	3.3	--	1.5	2.0	2.0	--	
--	--	--	--	--	2,000	120.0	5.0	2.5	2.5	Venezuela
--	60	6.0	100	20.0	0	0	0	0	--	
--	300	13.0	1,000	100.0	2,240	300.0	25.0	20.0	5.0	El Salvador
--	--	--	--	--	60	6.0	10.0	2.5	2.5	El Salvador
									2.5	Colombia
									2.5	Venezuela
--	60	6.0	12	12.0	400	40.0	15.0	8.0	3.0	El Salvador
									2.0	Colombia
									2.0	Venezuela
--	--	--	--	--	--	20.0	3.5	1.5	1.0	Venezuela
									1.0	Argentina
10.0	--	--	--	--	30	3.0	15.0	15.0	--	
2.0	--	--	--	--	--	17.[illegible]	2.0	0.5	0.5	Venezuela
									0.5	El Salvador
									0.5	Colombia
19.5	1,420	75.4	3,112	235.3	6,755	610.5	110.0	81.5	--	

Table 5

COLOMBIA ETV DEMAND, 1968-80

Educational Application of TV	Application Code*	Hours Transmitted								
		1968			1972			1980		
		Morning	Afternoon	Evening	Morning	Afternoon	Evening	Morning	Afternoon	Evening
Adult	1.1-1.5	--	--	--	--	5.0	5.0	--	5.0	5.0
	1.6	--	--	--	--	--	--	--	--	5.0
Teacher training	2.1	--	--	--	5.0	5.0	--	10.0	10.0	--
	2.2	--	1.0	--	--	2.0	--	--	2.0	--
Primary	3.1	--	--	--	--	--	--	2.5	2.5	--
	3.2-3.3	7.5	5.5	--	8.5	6.5	--	15.0	11.0	--
Secondary	4.1-4.2	--	--	--	5.0	5.0	--	15.0	12.0	--
Technical training	5.1-5.2	--	--	--	--	--	--	5.0	5.0	--
Higher education	6.1	2.5	--	--	10.0	5.0	--	10.0	5.0	00
	6.2	--	--	--	--	--	--	2.5	1.0	--
	6.3	--	--	--	--	--	--	--	--	--
	6.4-6.5	--	--	--	--	--	--	--	--	2.0
Totals		10.0	6.5	--	28.5	28.5	5.0	60.0	53.5	12.0
TV channels					2			4		

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* See Table 2 for breakdown of application codes.

Receivers (R) and Viewers (V) 1968 R	1968 V (000's)	1972 R	1972 V (000's)	1980 R	1980 V (000's)	Total Hours Distributed	Local Hours Generated	Externally Generated, 1980 Hours Received	Externally Generated, 1980 Source
--	--	140	7.0	1,000	50.0	10.0	10.0	--	
---	--	--	--	--	--	5.0	2.0	1.0	Venezuela
								1.0	Peru
								1.0	Chile
--	--	100	5.0	88	8.8	20.0	20.0	--	
--	3.6	--	5.0	--	11.6	2.0	2.0	--	
--	--	--	--	--	35.0	5.0	2.5	2.5	Venezuela
1,200	450.0	1,200	450.0	12,200	2,200.0	26.0	22.0	4.0	Venezuela
--	--	400	30.0	2,700	200.0	27.0	16.0	4.0	Venezuela
								5.0	Chile
--	--	--	--	50	5.0	10.0	2.5	2.5	Venezuela
								2.5	Chile
								2.5	Peru
5	0.2	40	4.0	100	10.0	15.0	8.0	3.0	Venezuela
								2.0	Chile
								2.0	Peru
--	--	--	--	--	5.0	3.5	1.0	1.0	Venezuela
								1.0	Chile
								0.5	Peru
--	--	--	--	--	--	--	--	--	
--	--	--	--	--	7.5	2.0	0.5	0.5	Venezuela
								0.5	Chile
								0.5	Peru
1,205	453.8	1,880	501.0	16,718	2,532.9	125.5	86.5		

Table 6

VENEZUELA ETV DEMAND, 1968-80

		Hours Transmitted								
		1968			1972			1980		
Educational Application of TV	Application Code*	Morning	Afternoon	Evening	Morning	Afternoon	Evening	Morning	Afternoon	Evening
Adult	1.1-1.5	--	--	--	--	--	--	--	--	--
	1.6	--	--	--	--	--	--	--	--	5.0
Teacher training	2.1	--	1.0	--	--	--	--	10.0	10.0	--
	2.2	--	1.0	--	--	1.0	--	--	2.0	--
Primary	3.1	2.5	--	--	2.5	2.5	--	2.5	2.5	--
	3.2-3.3	5.0	--	--	7.5	--	--	7.5	5.0	--
Secondary	4.1-4.2	7.5†	--	--	7.5†	--	--	8.0	7.0	--
Technical training	5.1-5.2	--	--	--	--	--	--	5.0	5.0	--
Higher education	6.1	--	--	--	10.0	5.0	--	10.0	5.0	--
	6.2	--	--	--	--	--	--	2.5	1.0	--
	6.3	--	--	--	--	--	--	--	5.0	10.0
	6.4-6.5	--	--	--	--	--	--	--	--	2.0
Totals		7.5	1.0	--	20.0	8.5	--	45.5	32.5	17.0
TV channels					2			3		

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* See Table 2 for breakdown of application codes.

† Summer only.

Receivers (R) and Viewers (V)									
1968		1972		1980				Externally Generated, 1980	
R	V (000's)	R	V (000's)	R	V (000's)	Total Hours Distributed	Local Hours Generated	Hours Received	Source
--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	5.0	2.0	1.0	Colombia
								1.0	Peru
								1.0	Chile
--	--	--	--	46	4.6	20.0	20.0	--	
--	0.2	--	0.5	--	5.5	2.0	2.0	--	
300	18.0	400	24.0	440	35.0	5.0	4.0	1.0	Colombia
450	45.0	500	150.0	6,950	1,250.0	12.5	9.5	3.0	Colombia
--	4.0	--	4.0	2,000	150.0	15.0	4.0	4.0	Colombia
								4.0	Peru
								3.0	Chile
--	--	--	--	40	4.0	10.0	2.5	2.5	Colombia
								2.5	Peru
								2.5	Chile
--	--	60	6.0	100	10.0	15.0	8.0	3.0	Colombia
								2.0	Peru
								2.0	Chile
--	--	--	--	--	5.0	3.5	1.5	1.0	Argentina
								1.0	Mexico
--	--	--	--	20	2.0	15.0	15.0	--	
--	--	--	--	--	5.3	2.0	0.5	0.5	Colombia
								0.5	Peru
								0.5	Chile
750	67.2	960	184.5	9,596	1,472.4	105.0	68.5	--	

Table 7

BRAZIL ETV DEMAND, 1968-80

Educational Application of TV	Application Code*	Hours Transmitted								
		1968			1972			1980		
		Morning	Afternoon	Evening	Morning	Afternoon	Evening	Morning	Afternoon	Evening
Adult	1.1-1.5	--	10.0	10.0	--	10.0	10.0	10.0	10.0	10.0
	1.6	--	--	--	--	--	--	--	--	5.0
Teacher training	2.1	--	--	--	--	--	--	10.0	10.0	--
	2.2	--	--	--	--	2.0	--	--	3.0	--
Primary	3.1	--	--	--	--	--	--	2.5	2.5	--
	3.2-3.3	5.0	--	--	10.0	--	--	8.5	6.5	--
Secondary	4.1-4.2	5.0	--	--	10.0	--	--	11.0	2.0	--
Technical training	5.1-5.2	5.0	--	1.0	10.0	--	1.0	5.0	5.0	2.0
Higher educational	6.1	--	--	--	--	--	--	10.0	5.0	--
	6.2	--	--	--	--	--	--	--	--	--
	6.3	--	--	--	--	--	--	--	5.0	10.0
	6.4-6.5	--	--	--	--	--	--	--	--	--
Totals	--	--	--	--	30.0	12.0	11.0	57.0	49.0	27.0
TV channels					2			4		

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* See Table 2 for breakdown of application codes.

Receivers (R) and Viewers (V)						Total Hours Generated, 1980	Source, 1980		
1968		1972		1980					
R	V (000's)	R	V (000's)	R	V (000's)		Recife	Rio	Sao Paulo
200	10.0	480	24.0	1,000	50.0	30.0	20.0	5.0	5.0
--	--	--	--	--	--	5.0	0	1.0	1.0
--	--	--	--	103	10.4	20.0	6.0	8.0	6.0
--	--	--	1.0	--	11.4	3.0	1.0	1.0	1.0
--	--	--	--	1,280	77.0	5.0	1.0	2.0	2.0
300	12.0	300	18.0	10,000	2,000.0	15.0	10.0	3.0	2.0
150	4.5	150	6.0	3,000	270.0	13.0	4.0	6.0	3.0
150	6.5	150	10.0	250	18.0	12.0	5.0	3.0	4.0
--	--	--	--	80	8.0	15.0	--	8.0	7.0
--	--	--	--	--	--	--	--	--	--
--	--	--	--	80	8.0	15.0	0	8.0	7.0
--	--	--	--	--	--	--	--	--	--
800	33.0	1,080	59.0	15,792	2,452.8	133.0	47.0	45.0	38.0

Table 8

ARGENTINA ETV DEMAND, 1968-80

		Hours Transmitted								
		1968			1972			1980		
Educational Application of TV	Application Code*	Morning	Afternoon	Evening	Morning	Afternoon	Evening	Morning	Afternoon	Evening
Adult	1.1-1.5	--	--	--	--	--	--	--	--	--
	1.6	--	--	--	--	--	--	--	--	5.0
Teacher training	2.1	--	--	--	--	--	--	10.0	10.0	--
	2.2	--	--	--	--	--	--	--	1.0	--
Primary	3.1	--	--	--	--	--	--	2.5	2.5	--
	3.2-3.3	--	--	--	--	--	--	7.5	5.0	--
Secondary	4.1-4.2	--	--	--	--	--	--	8.0	7.0	--
Technical training	5.1-5.2	2.5	--	--	2.5	--	--	5.0	5.0	--
Higher education	6.1	--	--	--	2.5	--	--	10.0	5.0	--
	6.2	--	--	--	--	--	--	2.5	1.0	--
	6.3	--	--	--	--	--	--	--	5.0	10.0
	6.4-6.5	--	--	--	--	--	--	--	--	2.0
Totals		2.5	--	--	5.0	--	--	45.5	41.5	17
TV channels					1			3		

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* See Table 2 for breakdown of application codes.

Receivers (R) and Viewers (V)						Total Hours Distributed	Local Hours Generated	Externally Generated, 1980	
1968		1972		1980					
R	V (000's)	R	V (000's)	R	V (000's)			Hours Received	Source
--	--	--	--	--	--	--	--	--	
--	--		--	--	--	5.0	2.0	1.0	Chile
								1.0	Uruguay
								1.0	Peru
--	--	--	--	23	2.2	20.0	20.0	--	
--	--	--	--	--	2.2	1.0	1.0	--	
--	--	--	--	420	25.0	5.0	2.5	2.5	Venezuela
--	--	--	--	2,050	370.0	12.5	9.5	3.0	Chile
--	--	--	--	1,070	80.0	15.0	8.0	3.0	Chile
								2.0	Uruguay
								2.0	Peru
?	?	30	3.0	60	6.0	10.0	2.5	2.5	Chile
								2.5	Peru
								2.5	Venezuela
--	--	20	0.8	200	20.0	15.0	8.0	3.0	Chile
								2.0	Peru
								2.0	Venezuela
--	--	--	--	--	10.0	3.5	1.5	1.0	Venezuela
								1.0	Mexico
--	--	--	--	40	4.0	15.0	15.0	--	
--	--	--	--	--	29.0	2.0	0.5	0.5	Chile
								0.5	Uruguay
								0.5	Peru
--	--	50	3.8	3,863	548.4	104.0	70.5	--	

Table 9

BOLIVIA ETV DEMAND, 1968-80

		Hours Transmitted								
		1968			1972			1980		
Educational Application of TV	Application Code*	Morning	Afternoon	Evening	Morning	Afternoon	Evening	Morning	Afternoon	Evening
Adult	1.1-1.5	--	--	--	4.0	--	--	5.0	--	--
	1.6	--	--	--	--	--	--	--	--	5.0
Teacher training	2.1	--	--	--	--	--	--	10.0	10.0	--
	2.2	--	--	--	--	--	--	--	2.0	--
Primary	3.1	--	--	--	--	--	--	2.5	2.5	--
	3.2-3.3	--	--	--	--	--	--	7.5	5.0	--
Secondary	4.1-4.2	--	--	--	--	--	--	8.7	7.0	--
Technical training	5.1-5.2	--	--	--	--	--	--	--	--	--
Higher education	6.1	--	--	--	--	--	--	--	--	--
	6.2	--	--	--	--	--	--	--	--	--
	6.3	--	--	--	--	--	--	--	--	--
	6.4-6.5	--	--	--	--	--	--	--	--	2.0
Totals		--	--	--	4.0	--	--	33.0	26.5	7.0
TV channels					1			2		

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* See Table 2 for breakdown of application codes.

Receivers (R) and Viewers (V)									
1968		1972		1980				Externally Generated, 1980	
R	V (000's)	R	V (000's)	R	V (000's)	Total Hours Distributed	Local Hours Generated	Hours Received	Source
--	--	10	1.0	300	15.0	5.0	5.0	--	
--	--	--	--	--	--	5.0	2.0	1.0	Peru
								1.0	Chile
								1.0	Colombia
--	--	--	--	4	0.6	20.0	20.0	--	
--	--	--	--	--	0.7	2.0	--	--	
--	--	--	--	120	7.0	5.0	2.5	2.5	Venezuela
--	--	--	--	560	113.0	12.5	8.5	4.0	Peru
--	--	--	--	107	8.0	15.0	4.0	4.0	Peru
								4.0	Chile
								4.0	Colombia
--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	
--	--	--	--	--	1.0	2.0	0.5	0.5	Peru
								0.5	Chile
								0.5	Colombia
--	--	10	1.0	1,092	145.3	66.5	44.5	--	

Table 10

CHILE ETV DEMAND, 1968-80

		Hours Transmitted								
		1968			1972			1980		
Educational Application of TV	Application Code*	Morning	Afternoon	Evening	Morning	Afternoon	Evening	Morning	Afternoon	Evening
Adult	1.1-1.5	--	--	--	--	--	--	--	--	--
	1.6	--	--	--	--	--	--	--	--	5.0
Teacher training	2.1	--	--	--	--	--	--	10.0	10.0	--
	2.2	--	--	--	--	1.0	--	3.0	--	--
Primary	3.1	--	--	--	--	--	--	2.5	2.5	--
	3.2-3.3	--	--	--	--	--	--	7.5	5.0	--
Secondary	4.1-4.2	--	--	--	--	--	--	8.0	7.0	--
Technical training	5.1-5.2	--	--	--	--	--	--	5.0	5.0	--
Higher education	6.1	--	--	--	--	--	--	10.0	5.0	--
	6.2	--	--	--	--	--	--	2.5	1.0	--
	6.3	--	--	--	--	--	--	--	--	--
	6.4-6.5	--	--	--	--	--	--	--	--	2.0
Totals		--	--	--	--	--	--	48.5	35.5	7.0
TV channels						1		3		

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* See Table 2 for breakdwon of application codes.

Receivers (R) and Viewers (V)								Externally Generated, 1980	
1968		1972		1980					
R	V (000's)	R	V (000's)	R	V (000's)	Total Hours Distributed	Local Hours Generated	Hours Received	Source
--	--	--	--	200	10.0	--	--	--	
--	--	--	--	--	--	5.0	2.0	1.0	Argentina
								1.0	Peru
								1.0	Bolovia
--	--	--	--	20	2.0	20.0	20.0	--	
--	--	60	6.0	--	1.5	3.0	3.0	--	
--	--	--	--	150	9.0	5.0	2.5	2.5	Venezuela
--	--	--	--	2,780	500.0	12.5	8.5	4.0	Argentina
--	--	--	--	1,300	100.0	15.0	4.0	4.0	Argentina
								4.0	Colombia
								4.0	Peru
--	--	--	--	50	5.0	10.0	2.5	2.5	Argentina
								2.5	Peru
								2.5	Colombia
--	--	--	--	100	10.0	15.0	8.0	3.0	Argentina
								2.0	Peru
								2.0	Colombia
--	--	--	--	--	5.0	3.5	1.0	1.0	Argentina
								1.0	Peru
								0.5	Colombia
--	--	--	--	--	--	--	--	--	
--	--	--	--	--	4.2	2.0	0.5	0.5	Argentina
								0.5	Peru
								0.5	Colombia
--	--	60	6.0	4,600	646.7	91.0	52.00	--	

Table 11

PERU ETV DEMAND, 1968-80

Educational Application of TV	Application Code*	Hours Transmitted								
		1968			1972			1980		
		Morning	Afternoon	Evening	Morning	Afternoon	Evening	Morning	Afternoon	Evening
Adult	1.1-1.5	--	--	--	4.0	--	--	5.0	--	--
	1.6	--	--	--	--	--	--	--	--	5.0
Teacher training	2.1	--	--	--	2.5	--	--	5.0	5.0	--
	2.2	--	--	--	--	--	--	--	2.0	--
Primary	3.1	--	--	--	--	--	--	2.5	2.5	--
	3.2-3.3	7.0	--	--	7.5	--	--	7.5	5.0	--
Secondary	4.1-4.2	--	--	--	--	--	--	8.0	7.0	--
Technical training	5.1-5.2	--	--	--	--	--	--	5.0	5.0	--
Higher education	6.1	--	--	--	--	--	--	10.0	5.0	--
	6.2	--	--	--	--	--	--	--	--	--
	6.3	--	--	--	--	--	--	--	--	--
	6.4-6.5	--	--	--	--	--	--	--	--	2.0
Totals		7.0	--	--	14.0	--	--	43.0	31.5	7.0
TV channels					1			3		

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* See Table 2 for breakdown of application codes.

Receivers (R) and Viewers (V)								Externally Generated, 1980	
1968		1972		1980					
R	V (000's)	R	V (000's)	R	V (000's)	Total Hours Distributed	Local Hours Generated	Hours Received	Source
--	--	70	7.0	500	25.0	5.0	5.0	--	
--	--	--	--	--	--	5.0	2.0	1.0	Bolivia
								1.0	Colombia
								1.0	Chile
--	--	5	0.5	16	1.6	10.0	10.0	--	
--	--	--	--	--	2.2	2.0	2.0	--	
--	--	--	--	200	12.0	5.0	2.5	2.5	Venezuela
60	1.3	100	3.0	5,000	1,000.0	12.5	8.5	4.0	Bolivia
--	--	--	--	1,300	100.0	15.0	4.0	4.0	Bolivia
								4.0	Colombia
								3.0	Chile
--	--	--	--	30	3.0	10.0	2.5	2.5	Venezuela
								2.5	Colombia
								2.5	Chile
--	--	--	--	25	2.5	15.0	8.0	3.0	Colombia
								2.0	Venezuela
								2.0	Chile
--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	
--	--	--	--	--	5.0	2.0	0.5	0.5	Venezuela
								0.5	Colombia
								0.5	Chile
60	1.3	175	10.5	7,071	1,151.3	81.5	45.0		

Table 12

URUGUAY ETV DEMAND, 1968-80

Educational Application of TV	Application Code*	Hours Transmitted								
		1968			1972			1980		
		Morning	Afternoon	Evening	Morning	Afternoon	Evening	Morning	Afternoon	Evening
Adult	1.1-1.5	--	--	--	--	--	--	--	--	--
	1.6	--	--	--	--	--	--	--	--	5.0
Teacher training	2.1	--	--	--	--	--	--	2.5	--	--
	2.2	--	--	--	--	--	--	--	1.0	--
Primary	3.1	--	--	--	--	--	--	2.5	2.5	--
	3.2-3.3	--	--	--	2.5	--	--	8.5	6.5	--
Secondary	4.1-4.2	--	--	--	--	--	--	8.0	7.0	--
Technical training	5	--	--	--	--	--	--	--	--	--
Higher education	6.1	--	--	--	--	--	--	10.0	5.0	--
	6.2	--	--	--	--	--	--	--	--	--
	6.3	--	--	--	--	--	--	--	--	--
	6.4-6.5	--	--	--	--	--	--	--	--	2.0
Totals		--	--	--	2.5	--	--	31.5	32.0	7.0
TV channels					1			2		

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* See Table 2 for breakdown of application codes.

Receivers (R) and Viewers (V)						Total Hours Distributed	Local Hours Generated	Externally Generated, 1980	
1968		1972		1980				Hours Received	Source
R	V (000's)	R	V (000's)	R	V (000's)				
--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	5.0	2.0	1.0	Argentina
								1.0	Chile
								1.0	Peru
--	--	--	--	7.0	0.8	2.5	2.5	--	
--	--	--	--	--	0.7	1.0	1.0	--	
--	--	--	--	80.0	5.0	5.0	2.5	2.5	Venezuela
40	1.6	40	1.6	330.0	100.0	15.0	9.5	3.0	Argentina
--	--	--	--	400.0	30.0	15.0	8.0	3.0	Argentina
								2.0	Chile
								2.0	Peru
--	--	--	--	--	--	--	--	--	
--	--	--	--	5.0	0.5	15.0	8.0	3.0	Argentina
								2.0	Chile
								2.0	Peru
--	--	--	--	--	--	--	--	--	
--	--	--	--	--	--	--	--	--	
--	--	--	--	--	2.3	--	--	--	
40	1.6	40	1.6	822.0	139.3	58.5	33.5	--	

regarded as a generous estimate applicable to the 1969-1974 period. The use of planned activity, regardless of firm budgets, may bias the resulting demand on the high side, but this bias may, in turn, be offset by now unforeseen or unreported applications that could become operational by 1972.

The estimate for 1980 is an attempt to estimate a ceiling for the ability of the selected countries to organize each application shown within the next 10-15 years. The amount of programming and the number of receivers and viewers shown are what seem possible given only constraints in software, not hardware, capabilities. Money was not yet considered as a constraint, since the initial objective is to prepare for the subsequent analytical step of calculating system requirements and costs consequences for the demand estimates. The 1980 estimates are deliberately generous figures, to give the overall study a range of activity from present levels to some future higher levels and to examine the system and cost implications for this range.

The distinction between morning, afternoon, and evening for transmitting hours is necessary to establish channel capacity. The maximum capacity of one channel is about three hours each morning, for example, or 15 hours per five-day school week.

The number of viewers (V) shown applies only to those participating in some kind of organized reception. The figures do not attempt to include the additional viewers who tune in the program in their homes but who have not registered to receive the student instructional materials supplied for the course. The estimated number of student viewers for 1980 was determined by calculating, for each ETV application, the total 1980 population that could benefit from the particular application. For the ETV Primary Education application (codes 3.1, 3.2, 3.3) the process is illustrated by Table 13. In this table, the growth rate for the period from 1963 to 1980 (Column 5) was estimated, representing a judgmental combination that takes into account enrollment ratio (Column 1), population growth (Column 3), and enrollment increase from 1958-63 (Column 4). The enrollment ratio roughly expresses how much farther the country has to go to achieve universal compulsory education, which would correspond to a 100 percent enrollment ratio. Clearly, those countries that have almost achieved this objective, for example, Costa Rica and Chile, will experience an enrollment growth closer to population growth.

To determine the number of potential viewers in a country, the population that could benefit from a particular application was then reduced to reflect the geographical population distribution and the probable managerial capabilities for extending the ETV system. The resulting participation of various groups varies from 45 percent of population (primary education in Colombia), down to very small percentages of populations when the application was judged to be lower priority or taxing to the managerial capabilities of the country.

The resulting demand estimates for the two largest ETV applications (primary and secondary education) are shown in Table 14.

Table 13

DERIVATION OF PRIMARY SCHOOL ENROLLMENT PROJECTION TO 1980

Country	1963 Unadjusted Enrollment Ratio (%)	1963 Enrollment (000's)	1965-80 Population Growth (%/yr)	1955-63 Enrollment Growth (%/yr)	1963-80 Enrollment Growth (%/yr.)
Costa Rica	73	249.3	3.2	9.1	3.6
El Salvador	49	358.4	3.2	7.1	5.0
Guatemala	36	377.4	3.2	7.3	5.0
Honduras	47	251.5	3.2	8.8	5.0
Mexico	61	6,095.0	3.2	7.0	4.0
Nicaragua	46	191.4	3.2	5.0	5.0
Panama	64	186.7	3.2	4.0	3.6
Argentina	68	2,990.0	1.3	1.6	1.3
Bolivia	49	495.1	2.9	6.8	5.0
Brazil	50	8,854.0	2.9	7.8	5.0
Chile	69	2,305.0	1.3	3.9	2.5
Colombia	51	2,096.0	2.9	6.8	5.0
Peru	59	1,700.0	2.9	5.9	5.0
Uruguay	59	320.0	1.3	1.9	2.5
Venezuela	72	1,371.0	2.9	9.8	3.6

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* Calculated by multiplying 1963 enrollment by 1963-80 growth factor for each country.

Source: UNESCO Statistical Yearbook, 1965, Tables 2, 9, and 11.

Country	1963-80 Growth Factor	1980 Enrollment* (000's)
Costa Rica	1.824	455
El Salvador	2.292	822
Guatemala	2.292	864
Honduras	2.292	575
Mexico	1.948	11,400
Nicaragua	2.292	439
Panama	1.824	341
Argentina	1.246	3,720
Bolivia	2.292	1,135
Brazil	2.292	20,300
Chile	1.521	1,990
Colombia	2.202	4,790
Peru	2.292	3,900
Uruguay	1.521	487
Venezuela	1.824	2,500

Table 14

PARTICIPATION IN ETV, 1980:
PRIMARY AND SECONDARY SCHOOL ENROLLMENT

Country	Ratio of Viewers to Estimated 1980 Enrollment	
	Primary Education	Secondary Education
Central America	.25	.30
Mexico	.01	.06
Colombia	.45	.13
Venezuela	.40	.14
Brazil	.10	.05
Argentina	.10	.22
Bolivia	.10	.02
Chile	.10	.18
Peru	.11	.01
Uruguay	.20	.14

Low ratios reflect local statements that no widespread use of ETV is contemplated in that application.

In a subsequent section, the cost and system design consequences of increasing the ETV participation ratios shown in the above table are examined.

The number of receivers (R) is defined similarly to the number of viewers, as the number of sets that receive the program under organized reception conditions, that is, in a telecenter or teleclassroom, with a monitor or teacher present. Where viewers have easy access to receivers already provided for another ETV application, only the receivers needed for the primary application were counted. For example, inservice training of teachers, usually one hour per week, could be accomplished at schools equipped with sets to receive the primary-or secondary-level programs. If receivers were also attributed to inservice teacher training, there would be double-counting of receiver requirements.

Not all the applications shown would necessarily be available everywhere in the in-country network. Higher education applications, for example, would probably need to be available only where major universities are located. Thus, in the 1980 estimate for Colombia, for example, full programming (requiring four channels) was assumed to be made available by transmitters located in Bogotá, Medellín and Cali. Only three channels would be required elsewhere in Colombia for the basic applications of primary and secondary education.

The last six columns of Tables 3-12 all apply to the 1980 estimate. Hours distributed is the sum of morning, afternoon, and evening hours transmitted. The hours generated are the hours of local (in-country) program production.

International Traffic

The last two columns of Tables 3-12 show the external sources of programming and the number of hours for each. For simplicity, generally no more than three external sources were estimated. Neighboring, not remote, countries were usually proposed as external sources, to conform to preferences Latin Americans expressed for subregional cooperation, rather than continentwide exchanges.

Forecasting the content and extent of interchange of educational programs is fraught with uncertainty. Despite the establishment in Latin

America of many multilateral organizations,* representing both public and private interests, regional (transnational) concerns now affect only a tiny fringe of the education and training sectors in Latin America. The problem of achieving a national identity and coherence, much less an international unity, is a sufficiently complex preoccupation for most of the countries. It occupies, in various ways, a prominent part of the local agenda in politics, economics, and education and training. To illustrate this point, one observer remarked that "Brazil is a subcontinent, not yet a nation." Of even the smaller and apparently more cohesive Colombia, a high government official stated, "Colombia is 22 little countries."

Only in Central America has real progress been made in seeking regional solutions to economic and educational problems. Two illustrative educational activities being approached on multilateral bases there are the program of common primary textbooks and coordination among institutions of higher education. Officials in Central America have received support and encouragement from the U.S. assistance program in the several efforts toward regionalism.

Throughout the field work of the study, key Latin American personnel in education and training were asked to assess the prospects for exchanging or sharing ETV programs among several Latin American countries. Most of the responses were pessimistic. Several obstacles were cited: variation in stages of economic development; differences in political ideology and stability; differences in regional dialects and word meanings;

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* Covered at length in Appendix C.

differing interpretations of history (since history is taught from national, not regional viewpoints): and absence or weakness of intercountry educational, cultural, and economic relationships (most Latin American countries have more fully developed relationships with countries outside the continent than with their neighbors).

Content at the same grade level differs from one Spanish-speaking Latin American country to the next in nearly every subject, for example, in geography, history, and even the Spanish language. A precondition for accepting some common ETV programs would be efforts to harmonize curricula content. While OAS committees have been formed to examine common curriculum matters, only efforts at the Central America levels and the beginning discussions of primary textbook coordination among Venezuela, Colombia, and Ecuador seem to have produced results so far. This observation is consistent with a publication of the OAS Ad Hoc Committee on Education, which states in part:

> In the field of education, with the exception of what has been accomplished in Central America, which is acting with some favorable results, little or no success is being obtained in the field of integration, from the standpoint of both its contents and its structure. There are some ties that do lean toward integration, basically or apparently, derived from regional fellowship and teacher exchange programs. For the reasons given, the present situation makes it advisable for it to be dealt with gradually and carefully on the basis of past experience.*

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* Excerpted from Multinational Projects Prepared by the General Secretariat of the Organization of American States, OAS, Document 4, Appendix 1, December 21, 1967, p. 72.

Perhaps multilateral efforts in education will get underway with the planned appointment of an OAS Assistant Secretary for Education.

The subjects on which Latin Americans feel collaborative efforts for television programming could begin are science and mathematics. First, these subjects are as culture-free as possible and therefore pose a minimum threat to national sensitivities. Second, considerable interest exists in each country in modernizing, or further modernizing, instruction in these subjects. This applies both at the secondary and higher education levels.

The provision of a televised science and mathematics series could be associated with, and reinforce, structural changes that are beginning to take place in some of the Latin American countries at these two levels, discussed elsewhere in this report. Secondary schools of larger size and serving students with diverse educational objectives would offer the potential for economical reception of televised science and mathematics instruction. Certain rooms could be equipped for reception, and good utilization could be obtained by scheduling television classes there throughout the day and for night school.

The formation of institutes within universities--a structural change described in Sections II and III of this report--offers an opportunity for preparing and using high quality instructional programs that will reach the many identical sections of basic courses such as chemistry, biology, physics, and mathematics. Since this organizational shift is beginning in several Latin American countries, institutions of higher education in two or more countries might be interested in exchanging programs by ETV.

Where it appears that a country will have established a position of leadership in a particular application relevant to several countries' needs, it was assumed that other countries will be interested in acquiring that program. For example, Venezuela's kindergarten television program is at present the most advanced for this level of any in Latin America. Accordingly, it was assumed that other Spanish-speaking Latin American countries would use parts of this series, combining it with about equal parts of locally produced programs. Other countries, in turn, will establish comparative advantage in some other ETV application.

It is assumed that internationally oriented programs will be planned and allocated by an appropriately constituted regional commission comprising representatives from the countries interested in pooling programs. This body would review domestic programs that are candidates for pooling and select those having wide utility. The commission would require support from curriculum committees in each of the educational applications for which there are to be international exchanges. Scheduling problems of simultaneous versus nonsimultaneous reception are discussed in a subsequent section.

Despite the lack of evidence that countries can exchange substantial amounts of ETV programming, this study has projected a considerable international traffic of this kind for 1980. On the average, it is projected that about 25 percent of all hours broadcast by an ETV station will be imported educational programs produced under some sort of joint auspices in some other Latin American country.

The international exchanges of programming for the 1980 estimate are shown in Table 15, which is presented in the form of an origination-destination matrix. The specific origination-destination combinations should be considered only illustrative. Other combinations could be proposed, but they would have relatively little effect on the system and cost requirements that are important in this analysis. The important estimate is the fraction of total programming that a country will be willing to accept from external sources. If this fraction is high, then communications systems with large coverage will be less effective than shown by our results.

The prospects and the potential for multinational cooperation in Latin America are treated at length in Professor Hanna's paper "The Emerging Interamerican Community," Appendix C of this volume.

ETV Geographical Coverage

Cities to be served by ETV were selected for the two years used in the demand estimates, 1972 and 1980. Metropolitan areas selected, together with the fraction of country population residing in the selected areas and the number of video channels each requires in 1972 and 1980, are presented in Table 16. The criteria for selection included size of population, location within the country's planned microwave network, economic and political importance, and the project team's attempt to cover the main regions of each country with at least one ETV transmitting station. As will be noted from the percent of total country population residing in the selected areas, between 20 percent and 45 percent of population is covered. These figures understate the true coverage for 1980 by as much

Table 15

INTERNATIONAL ETV TRAFFIC, 1980: 9 LATIN AMERICAN CITIES (Hours Per Week)

Origination	Destination Bogotá	Caracas	Lima	La Paz	Santiago	Buenos Aires	Montevideo
Bogotá	--	15.0	11.0	5.5	9.5	--	--
Caracas	18.5	--	7.5	2.5	2.5	8.0	2.5
Lima	6.5	9.0	--	9.5	--	8.0	5.0
La Paz	--	--	9.0	--	1.0	--	--
Santiago	12.0	9.0	9.0	5.5	--	13.0	5.0
Buenos Aires	--	1.0	--	--	16.0	--	10.0
Montevideo	--	--	--	--	--	3.5	--
San Salvador*	--	--	--	--	--	--	--
Mexico City	--	1.0	--	--	--	1.0	--
Total hours imported	37.0	35.0	36.5	23.0	29.0	33.5	22.5

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* Clearing house point for six Central American countries.

Origination	San Salvador*	Mexico City	Total Unduplicated Hours Exported
Bogotá	12.0	6.0	15.0
Caracas	13.5	9.5	18.5
Lima	--	--	9.5
La Paz	--	--	9.0
Santiago	--	--	13.0
Buenos Aires	--	1.0	16.0
Montevideo	--	--	3.5
San Salvador*	--	12.0	12.0
Mexico City	13.0	--	13.0
Total hours imported	38.5	28.5	

Table 16

ESTIMATED POPULATION RESIDING IN SELECTED LATIN AMERICA AREAS AND NUMBER OF ETV STATIONS INCLUDED IN DEMAND ESTIMATE

Country	Population* (000's)	Percent of Country Population	No. of Channels 1972	1980
Central America				
Guatemala City	721		1	3
San Salvador	351		1	3
Tegucigalpa	171		1	3
Managua	274		1	3
San José	339		1	3
Panamá	430		1	3
Total	2,286	15.8%	1	3
Mexico				
Mexico City	4,109		2	3
Guadalajara	1,383		2	3
Monterrey	1,063		2	3
Puebla	436		1	3
Veracruz Llave	224		1	2
Juárez	418		0	2
Durango	164		0	2
Chihuahua	263		0	2
Total	8,090	18.3%	2	3
Colombia				
Cartagena	303		1	3
Bogotá	1,697		2	4
Cali	1,016		2	4
Medellín	971		2	4
Ibaqué	200		1	3
Bucaramanga	314		1	3
Total	4,501	24.1%	2	4

Table 18 (continued)

Country	Population* (000's)	Percent of Country Population	No. of Channels 1972	No. of Channels 1980
Venezuela				
Caracas	1,764		2	3
Barcelona	54		0	2
Merida	58		0	2
Maracaibo	699		2	2
Barquisimeto	306		2	2
Cuidad Bolívar	79		0	2
Maracay	208		0	2
Total	3,168	35.1%	2	3
Brazil				
Pôrto Alegre	1,028		1	2
Curitiba	728		1	2
São Paulo	5,123		2	4
Río de Janeiro	4,886		2	4
Belo Horizonte	1,161		1	2
Brasília	250		1	2
Recife	1,263		1	2
Minas Novas	3		0	2
Jequié	50		0	1
Salvador	1,040		0	2
Natal	255		0	2
Fortaleza	608		0	2
Belém	589		0	2
Total	16,984	20.1%	2	4
Argentina				
Mar del Plata	178		0	2
Bahía Blanca	150		0	2
Buenos Aires	7,000		1	3
Rosario	672		0	3
Santa Fé	260		0	3
Cordoba	589		0	3
Corrientes	113		0	2
Mendoza	109		0	2
Tucumán	287		0	2
Total	9,358	41.2%	1	3

Table 16 (concluded)

Country	Population* (000's)	Percent of Country Population	No. of Channels	
			1972	1980
Bolivia				
La Paz	450		1	2
Oruro	109		0	1
Sucre	73		0	1
Potosi	69		0	1
Cochabamba	115		0	1
Santa Cruz	91		0	1
Total	907	24.2%	1	2
Chile				
Santiago	2,271		1	3
Valparaíso	350		0	3
Antofagasta	140		0	2
Osorno	69		0	2
Arica	54		0	2
Concepción	218		0	2
Total	3,102	35.5%	1	3
Peru				
Lima	1,436		1	3
Arequipa	135		1	2
Puno	30		1	2
Piura	54		1	2
Chiclayo	120		0	2
Trujillo	125		0	2
Cuzco	88		0	2
Tacna	34		0	2
Total	2,022	16.8%	1	3
Uruguay				
Montevideo	1,203		1	2
Punta del Este	6		0	2
Total	1,209	44.0%	1	2

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* Data from United Nations Demographic Yearbook, 1966 and World Atlas, 1966 (Hammond, Inc.).

as 10 percent of total population, because (1) urban areas in Latin American countries are growing at about twice the growth rate of the country as a whole, and (2) a television transmitter serves an area of 50 mile diameter or more, within which would lie additional towns and rural areas for which population was not included in the definition of urban agglomeration.

The data on number of television channels shown in Table 16 were based on estimates of demand. The full number of channels was assigned to capital cities and to other main centers, particularly those having important institutions of higher education. In lesser cities, the number of channels reflects the capacity that would be needed for primary and secondary levels of ETV.

Demand Summary

The product of the number of viewers (students), multiplied by the hours per week that those viewers are engaged in ITV, is a useful measure of demand for a particular ETV application. It is a better measure than the number of viewers unweighted by programming frequency and intensity, because some educational programs may appear only one-half hour per week, while other applications may be shown daily, in both the morning and the afternoon. Table 17 has been prepared from the demand estimates for 1968, 1972, and 1980 to reflect this measure of viewer hours per week. The index of viewer hours per week shows a 14-fold increase between the 1968 actual data and the 1980 estimate; a two-fold increase is expected by 1972.

Table 17

DEMAND IN VIEWER HOURS PER WEEK FOR ETV APPLICATIONS: 1968, 1972, 1980

(Viewer Hours per Week in Thousands)

ETV Application	Application Code	Central America			Mexico			Colombia		
		1968	1972	1980	1968	1972	1980	1968	1972	1980
Adult education	1.1-1.5	--	--	100.0	375.0	750.0	750.0	--	70.0	500.0
	1.6	--	--	--	--	--	--	--	--	--
Teacher training	2.1	--	6.0	152.0	--	--	50.0	--	50.0	176.0
	2.2	--	20.0	4.4	0.8	6.6	3.0	3.6	10.0	23.2
Primary education	3.1	--	--	165.0	--	--	600.0	--	--	175.0
	3.2-3.3	--	9.1	10,395.0	30.0	150.0	0	585.0	6,750.0	57,200.0
Secondary educatio	4.1-4.2	--	2,000.0	6,000.0	130.0	2,500.0	7,500.0	--	300.0	5,400.0
Technical training	5.1-5.2	--	--	20.0	--	--	60.0	--	--	50.0
Higher education	6.1	--	--	60.0	90.0	180.0	600.0	0.5	60.0	150.0
	6.2	--	--	--	--	--	70.0	--	--	17.5
	6.3	--	--	--	--	--	45.0	--	--	--
	6.4-6.5	--	--	4.0	--	--	35.0	--	--	15.0
Total			2,035.1	16,900.4	625.8	3,586.6	9,713.0	5,854.1	7,240.0	63,706.7

ETV Application	Application Code	Venezuela			Brazil			Argentina		
		1968	1972	1980	1968	1972	1980	1968	1972	1980
Adult education	1.1-1.5	--	--	--	200.0	480.0	1,500.0	--	--	--
	1.6	--	--	--	--	--	--	--	--	--
Teacher training	2.1	--	--	92.0	--	--	208.0	--	--	44.0
	2.2	0.2	0.5	11.0	--	--	34.2	--	--	2.2
Primary education	3.1	27.0	120.0	175.0	--	--	385.0	--	--	125.0
	3.2-3.3	225.0	1,125.0	15,625.0	60.0	180.0	30,000.0	--	--	4,625.0
Secondary education	4.1-4.2	30.0	30.0	2,250.0	22.5	60.0	3,510.0	--	--	1,200.0
Technical training	5.1-5.2	--	--	40.0	39.0	110.0	216.0	--	7.5	60.0
Higher education	6.1	--	90.0	150.0	--	--	120.0	--	2.0	300.0
	6.2	--	--	17.5	--	--	--	--	--	35.0
	6.3	--	--	30.0	--	--	120.0	--	--	60.0
	6.4-6.5	--	--	10.6	--	--	--	--	--	58.0
Total		282.2	1,365.5	18,401.1	321.5	830.0	36,093.2	--	9.5	6,509.2

Table 17 (concluded)

ETV Application	Application Code	Bolivia			Chile			Peru		
		1968	1972	1980	1968	1972	1980	1968	1972	1980
Adult education	1.1-1.5	--	4.0	75.0	--	--	--	--	28.0	125.0
	1.6	--	--	--	--	--	--	--	--	--
Teacher training	2.1	--	--	12.0	--	--	40.0	--	--	16.0
	2.2	--	--	1.4	--	6.0	4.5	--	--	4.4
Primary education	3.1	--	--	35.0	--	--	45.0	--	--	60.0
	3.2-3.3	--	--	1,412.5	--	--	6,250.0	9.1	22.5	12,500.0
Secondary education	4.1-4.2	--	--	120.0	--	--	1,500.0	--	--	1,500.0
Technical training	5.1-5.2	--	--	--	--	--	50.0	--	--	30.0
Higher education	6.1	--	--	--	--	--	150.0	--	--	37.5
	6.2	--	--	--	--	--	17.5	--	--	--
	6.3	--	--	--	--	--	--	--	--	--
	6.4-6.5	--	--	2.0	--	--	8.4	--	--	10.0
Total			4.0	1,657.9		6.0	8,065.4	9.1	50.5	14,282.9

ETV Application	Application Code	Uruguay			Total		
		1968	1972	1980	1968	1972	1980
Adult education	1.1-1.5	--	--	--	575.0	1,332.0	3,050.0
	6.1	--	--	--	--	--	--
Teacher training	2.1	--	--	16.0	--	56.0	822.0
	2.2	--	--	0.7	4.6	43.1	89.0
Primary education	3.1	--	--	25.0	27.0	120.0	1,790.0
	3.2-3.3	4.0	4.0	1,500.0	6,178.1	8,240.6	139,507.5
Secondary education	4.1-4.2	--	--	450.0	182.5	4,890.0	29,430.0
Technical training	5.1-5.2	--	--	--	39.0	117.5	526.0
Higher education	6.1	--	--	7.5	90.5	332.0	1,575.0
	6.2	--	--	--	--	--	157.5
	6.3	--	--	--	--	--	255.0
	6.4-6.5	--	--	--	--	--	143.0
Total	4.0	4.0	4.0	1,999.2	7,096.7	15,131.2	177,329.0
Index					100.0	212.0	1,410.0

Among the countries studied, the largest demand was found to be in Colombia, followed by Brazil and then countries of Central America. Colombia and Central America were expected to be the most active because of their current large scale use of ETV. Currently, there are a number of scattered small scale applications in Mexico; however, there was no justification for projection of growth there as in Colombia, Venezuela, Central America, or Peru, because Mexico does not appear to have any consistent policy or commitment to television as a central tool for achieving educational development objectives. Of course, the size and potential wealth of Mexico, Brazil, and Argentina are such that any of these three countries could easily take a leadership position in ETV during the next decade.

V COMPUTER-BASED MODELS FOR ESTIMATING HARDWARE AND SOFTWARE COSTS

Introduction

In accordance with the study design outlined in Figure 1 (Section I), the pattern of human resource development objectives in 13 Latin American countries was analyzed (Section II); present and projected educational applications of television were inventoried (Section III); and existing, planned, and potential speculated demands for ETV were measured (Section IV).

This section presents the computer-based cost models that were designed to generate cost elements for the four alternative ETV distribution systems selected for assessment: truck or air shipment of video tapes (A); microwave network transmission (B); rebroadcast satellite (C); and direct broadcast satellite (D). These systems are illustrated in Figure 2.

Computer-based cost models were used to provide the flexibility required to explore a wide range of demand levels, geographical coverages, network configurations, procurement policies relating to hardware subject to economies of scale, and other policy and technical alternatives. The cost models were tailored to the particular policy options offered by the four basic types of ETV distribution systems considered.

Four computer programs were developed to assist in exploring the design options of the four distribution systems and to calculate the cost consequences of the specified ETV demand requirements. The development of these cost models is described at length by Andrew J. Lipinski, in

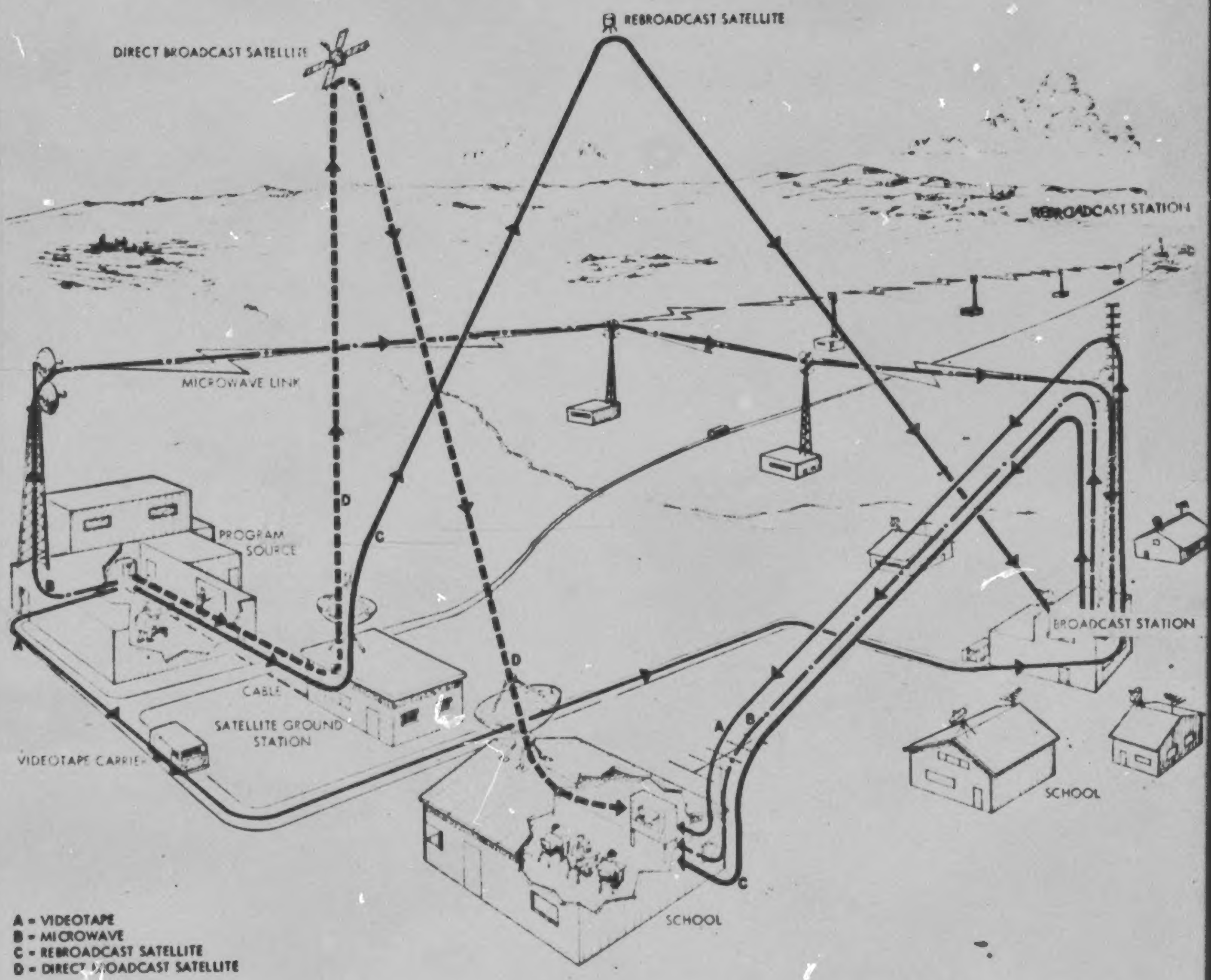

DIRECT BROADCAST SATELLITE
REBROADCAST SATELLITE
REBROADCAST STATION
MICROWAVE LINK
PROGRAM SOURCE
D
C
CABLE
SATELLITE GROUND STATION
VIDEOTAPE CARRIER
A
B
D
BROADCAST STATION
A
B
C
SCHOOL
SCHOOL
A = VIDEOTAPE
B = MICROWAVE
C = REBROADCAST SATELLITE
D = DIRECT BROADCAST SATELLITE

FIGURE 2

ALTERNATIVE ETV DISTRIBUTION MODES

Working Paper No. 6 in Volume IV of this report series. The four computer programs and their principal objectives are as follows:

Program	Objective
Educational support costs	To determine costs and manpower required for ETV program production and distribution, based on parameters of hours of new programming, sets in use in organized reception, and salary levels.
Terrestrial transmission systems	To determine costs of terrestrial delivery modes (VT and microwave), based on cities to be served, channels required, existence of microwave links, and inventory of video tape required at main and subcenters
Rebroadcast satellite	To calculate cost of satellite, launch, and earth stations for transmitting and receiving.
Direct broadcast satellite	To calculate cost of satellite, launch, and of augmentations to receivers (rooftop antenna, pre-amp, and feed).

These computer programs are described in the following pages, and the most economical runs are presented here and in Appendix D. To hold this report to a reasonable length, only a sample portion of the terrestrial transmission systems program is reproduced.

Educational Support Costs Program

Interpretation of Printout

In each of the four programs, the starting time can be chosen to be any year from 1970 to 1979, and the printout was programmed to start with the year chosen. The hours generated per week refer to the total of transmitted hours and include both the original and the playback material.

It is assumed that one-third of each previous year's material is discarded and remade.

The dollar costs of a new program include only personnel costs, since video tape costs are accumulated by the terrestrial program. Equipment, studio costs, and building costs appear next in the printout and are based on the hours of program material transmitted per week.

The number of television sets at the beginning and at the end of the period are used to interpolate the number of sets for each intervening year and assume a constant growth rate of sets.

The yearly salary of the teachers' instructor is used to calculate the cost of teacher training courses, including the initial course at the beginning of the program and the annual refresher course.

Television set upkeep costs are calculated by assuming that each maintenance technician can look after 400 sets each year. His transportation costs are added to his annual salary.

Support literature assumes that each teacher (but not each student) uses a very minimal amount of support literature for each lesson. Field research teams perform the feedback function of interviewing the teachers, filing reports on the systems efficacy, and helping teachers to resolve current problems relating to the use of ITV.

Staffing requirements are derived by assuming the existence of a production center that varies in accordance with the number of 15-hour packages of program material.

As an illustration of the educational support program, the printout for Venezuela follows. The printouts of educational support costs for the remaining countries are contained in Appendix D.

```
>RUN
L.MOLL-A.LIPINSKI-STANFORD RESEARCH INSTITUTE
PROJECT 7150-EDUCATIONAL SUPPORT COSTS

TYPED IN FIGURES MUST BE SEPARATED BY COMMAS
TYPE THE YEAR WHEN PROGRAM IS TO START
ANY YEAR FROM 1970 TO 1979
1970
TYPE HOURS OF PROGRAM GENERATED PER WEEK AT THE BEGINNING
AND AT THE END OF THE PROGRAM
28.5,68.5
TYPE THE DOLLAR COST OF ONE HOUR OF A NEW PROGRAM
500
FOR   28.5 HRS PER WEEK OF FINAL  MATERIAL,   2 STUDIOS ARE NEEDED
EQUIPMENT COSTS FOR  2 STUDIOS ARE:$  383.6 THOUSANDS
BUILDING COSTS FOR STUDIOS ARE $  150.0 THOUSANDS
TOTAL STUDIO COSTS ARE $    533660.
AND $ 533660. AT THE END

TYPE IN NO. OF SETS AT THE START,AND AT THE END
OF THE PROGRAM
960,9596

TYPE YEARLY SALARY OF TEACHERS' INSTRUCTOR
5000

TYPE YEARLY SALARY ,TRAVEL COSTS OF SET MAINTENANCE TECHNICIAN
4500,1500
```

```
        ANNUAL PROGRAMMING AND TEACHER TRAINING COSTS
      INCLUDING OVERHEAD AND AMORTIZATION ($ THOUSANDS)

                       1970 1971 1972 1973 1974 1975 1976 1977 1978 1979
                       ---- ---- ---- ---- ---- ---- ---- ---- ---- ----
PERSONNEL COSTS         247  314  343  375  409  447  488  532  581  635
AMORT & UPKEEP EQT       84   84   84   84   84   84   84   84   84   84
AMORT & UPKEEP BLD        5    5    5    5    5    5    5    5    5    5
TEACHER INDOCTRIN.       43   23   30   39   50   65   84  108  140  181
SPPT LITERATURE         122  135  150  167  188  213  243  280  326  386
FIELD RESEARCH TMS        7   10   13   16   21   28   36   46   60   77
TOTAL ANNUAL COSTS      509  573  626  688  759  843  941 1058 1198 1369

TV SETS IN USE ARE: (THOUSANDS)
                        0.9  1.2  1.6  2.0  2.6  3.4  4.4  5.7  7.4  9.5
SET MAINTENANCE COSTS ARE:

                       18.0 24.0 30.0 36.0 42.0 54.0 72.0 90.0 *114 *144

THE OVERALL ANNUAL COSTS ARE:
                        527  597  656  724  801  897 1013 1148 1312 1513

THE COST OF SETS IS AS FOLLOWS:
                       *192 *247 *320 *413 *534 *689 *890 *115 *148 *191

THE COST OF ALL SETS IS:
  7844. THOUSAND $
```

```
THE STAFFING REQUIREMENTS ARE AS FOLLOWS:

           1970  1971  1972  1973  1974  1975  1976  1977  1978  1979
  GENMG      1     1     1     1     1     1     1     1     1     1
 PGMDIR      1     1     1     1     1     1     1     1     1     1
 DIRENG      1     1     1     1     1     1     1     1     1     1
 PRODIR      6     9     9     9     9     9    12    12    12    15
 GRPHIC      2     4     4     4     4     4     5     5     5     7
 TECSUP      0     1     1     1     1     1     1     1     1     2
 CAMERA      3     4     4     4     4     4     5     5     5     6
 LIGHTS      0     1     1     1     1     1     1     1     1     2
 AUDIO*      1     1     1     1     1     1     1     1     1     1
 VIDEO*      1     1     1     1     1     1     1     1     1     1
 TELCIN      1     1     1     1     1     1     1     1     1     1
 VTROPS      1     2     2     2     2     2     3     3     3     4
 MSTCON      1     1     1     1     1     1     1     1     1     1
 TRAFIC      1     1     1     1     1     1     1     1     1     1
 SCENES      1     1     1     1     1     1     1     1     1     1
 FILMTR      0     1     1     1     1     1     1     1     1     1
 CREWS*     14    21    21    21    21    21    28    28    28    35
 TELTEA      6     9     9     9     9     9    12    12    12    15
 SCRIPT      3     4     4     4     4     4     5     5     5     6
 CURADV      2     3     3     3     3     3     4     4     4     5
 UTILIZ     11    15    20    25    33    43    55    71    92   119
 SET MT      3     4     5     6     7     9    12    15    19    24

STOPPED AT: 79.6
```

Manpower Requirements

Table 18 presents manpower requirements. These requirements include only the manpower associated with program production, distribution, and utilization; they summarize the 1979 (1980) figures calculated in the educational support program.

The problems of manpower training for ETV establishments in Latin America will presumably have received some kind of general solution with the establishment of the projected OAS Training Center. Some considerations for assuring effectiveness of that center are the following:

- Ideally, there should be a single center coordinating ETV operations, with the possible exception of the purely technical aspects. If, for political reasons, it appears to be desirable to have more than one center, each center should be active in all aspects of the ETV problem. This is necessary, because the major difficulty in providing effective ETV is the integration of its various elements, from curriculum planning to feedback from the schools. If one function, such as production, is segregated, the production trainees are experiencing only an abstract situation and not one that will prepare them for the real world of ETV.
- The center should be a television training center and not an audio-visual training center. It should be clear to all concerned that ETV is not just another audio-visual aid but an entire instructional system. A great many audio-visual aids will be employed in ETV, but training must extend far beyond these aids into curriculum planning, system management, classroom utilization personnel, and so forth.

Table 18

ETV MANPOWER REQUIREMENTS ASSOCIATED WITH 1980 DEMAND ESTIMATE

(Number of Persons)

Position	Central America	Mexico	Colombia	Venezuela	Argentina	Brazil
General manager	1	1	1	1	1	1
Program manager	1	1	1	1	1	1
Director of engineering	1	1	1	1	1	1
Producer-director	15	18	18	15	12	24
Graphics	7	8	8	7	5	11
Technical supervisor	2	2	2	2	1	3
Cameraman	6	7	7	6	5	9
Lighting technician	2	2	2	2	1	3
Audio technician	1	2	2	1	1	2
Video technician	1	2	2	1	1	2
Telecine	1	2	2	1	1	2
Video tape recorder operator	4	4	4	4	3	6
Master controller	1	2	2	1	1	2
Traffic	1	2	2	1	1	2
Scenery	1	2	2	1	1	2
Filming	2	2	2	2	1	3
Crewmen	35	42	42	35	28	56
TV-teacher	15	18	18	15	12	24
Scriptwriter	6	7	7	6	5	9
Curriculum adviser	5	6	6	5	4	8
Utilization coordinator	118	208	208	119	48	197
Set maintenance engineer	24	42	42	24	10	40

Position	Bolivia	Chile	Peru	Uruguay	Total
General manager	1	1	1	1	10
Program manager	1	1	1	1	10
Director of engineering	1	1	1	1	10
Producer-director	9	9	9	9	138
Graphics	4	4	4	4	62
Technical supervisor	1	1	1	1	16
Cameraman	4	4	4	4	56
Lighting technician	1	1	1	1	16
Audio technician	1	1	1	1	13
Video technician	1	1	1	1	13
Telecine	1	1	1	1	13
Video tape recorder operator	2	2	2	2	33
Master controller	1	1	1	1	13
Traffic	1	1	1	1	13
Scenery	1	1	1	1	13
Filming	1	1	1	1	16
Crewmen	21	21	21	21	322
TV-teacher	9	9	9	9	138
Scriptwriter	4	4	4	4	56
Curriculum adviser	3	3	3	3	46
Utilization coordinator	13	57	88	10	1,066
Set maintenance engineer	3	12	18	3	218

- The center should be related to some genuine ongoing ETV operation, through which trainees may observe real problems and real solutions.

Specific manpower training requirements for the technical staff were also determined in the course of the analysis and are outlined below.

Position	Recommended Training Requirements
Television chief engineer	A B.E.E. degree and a minimum of one year of practical training, including two weeks at the Ampex school. Some supervised experience in ETV is desirable.
Television technical supervisor	A one-year course at a commercial or ETV school.
Television control technician	Six to twelve months of training at a commercial television station, depending on ability.
Video tape recording technician	Six to twelve months of commercial television training, including two to four weeks of specialized video tape instruction.
Television art director	Two months at an ETV installation in the United States or in the British CETO.
Television program director	Six months to one year of training in the United States or in the British CETO.
Television producer-director	Six months to one year of training, half in commercial television and at a television installation and half in actual pilot program development in an ETV operation.
Television production supervisor	Six months to one year of training at a commercial or educational television station. A short tour (two to four weeks) of U.S. ETV stations would be useful.
Motion picture cameraman	Three to six months of training in an ETV operation should be sufficient.

Terrestrial Transmission Systems Program

This program was run several times for the years 1972 and 1980. To hold this report to a reasonable length, only a sample run (for Bolivia in 1980) is presented to illustrate the program--or more properly, the dialogue that takes place between user and computer in the development of an ETV distribution system.

Interpretation of Printout

The user first selects, from a list of towns for which coordinates have been stored in computer memory, a set of towns to be connected. He then indicates the starting point, i.e., the first town in the complex.

Next, towns are divided into major centers from which programs are distributed, and minor centers, which receive and retransmit them. This distinction is necessary because of the video tape libraries. Major centers were assumed to store video tape material for a full year, while minor centers were assumed to store any given program for only four months. Four months was determined sufficient to allow for missed shipments, confused logistics, and replaying of programs some weeks apart.

The number of subcenters to be connected with the main center provides a built-in alarm bell that notifies the user that he is approaching the end of the system. The reasons for supplying this warning are described later.

The program calculates the great circle distances from the starting point to all other towns, selects two, the shortest and next shortest, and prints them out. It then offers the user an option of connecting the starting point to the nearest and next-nearest towns. However, the control is always transferred to the nearest town. This option is very useful in building the "dog leg" connections without being stranded at the end of the dog leg.

Next follows a series of computer questions relating to the facilities that would exist at the time for which the program is run (typically 1972 and 1980).

If an ETV station does exist, or is assumed to be in existence at the time for which the program is run, the costs reported are those required to build a stronger antenna mast and provide additional transmitting equipment for the number of channels required. If there is no ETV station, then the full costs of station building, equipment, and so forth, are reported.

In parallel with "building" a broadcast station, the computer program supplies it with a video tape library by (1) referring to the number of video channels to be broadcast, if the center is a minor one, or (2) by asking the user how many program hours are to be generated, if the center is one of major importance. In both cases the dollar amount required for tape inventory is printed out.

The connecting link from the center under consideration to the next center is supplied in two ways: by a truck carrying the video tape material, or by a microwave link able to carry two-way television.

Both delivery modes are always employed, and the comparative costs are printed out. However, when microwave is to be used, the costs depend on whether there already exists a television link capable of expansion. Additional costs of adding RF channels to an existing link are much less than those of constructing a facility initially, i.e., building access roads, sites, erecting towers, and so forth.

Typically, a television link can be expanded to 10 video channels in each direction, and the actual or projected utilization for communication purposes is usually one or two channels. There is, therefore, ample room for expansion. National needs, as derived by the demand analysis, do not exceed four channels in any country.

At the conclusion of the interrogation concerning each city-to-city link, the following cost information is available:

- Cost of a new, or expanded, ETV broadcast station
- Cost of a new, or expanded, television microwave link
- Cost of a tape library
- Annual cost of operating a tape library
- Cost of transporting video tape
- Annual cost of using a microwave link

This information is organized into investment costs and annual costs by means of a continuously updated summary.

The sample run for Bolivia follows.

```
A.J.LIPINSKI STANFORD RESEARCH INSTITUTE
THIS PROGRAM WILL HELP YOU TO CALCULATE
COSTS OF ALTERNATIVE TERRESTRIAL TRANSMISSION SYSTEMS

THE COORDINATES OF MAJOR TOWNS
HAVE ALREADY BEEN STORED IN MEMORY
THEIR ABBREVIATED NAMES ARE:


RECIFE SALVAO RIO DJ S PAUL BRASIL MVIDEO BU AIR CORDOB MENDOZ SANTIA
VALPAR ANTOFA ARICA* AREQUI LIMA** PIURA* LA PAZ GUAYAQ QUITO* BOGOTA
MERIDA CARACA BARCEL ROSARI BELEM* BELO H P ALEG CURITI NATAL* FORTAL
MEDELI BUCARA BARQUI IBAGUE CUZCO* IBARRA PASTO* CHICLA TACNA* ORURO*
CARTAG CONCEP LAS FL B BLAN STA FE DELEST TRUJIL S LOUI M DL P S JUAN
IQUIQE SUCRE* POTOSI ANTIOQ SMARTA M NOVA JEQUIE
CALI** BOLIVA MARACA MRACAY PUNO** COCHAB S CRUZ OSORNO TUCUMA CORRIE

USING THE ABOVE ABBREVIATION TYPE THE NAME
OF TOWN TO START FROM AND,THE NUMBER OF TOWNS TO BE LINKED
LA PAZ,6
USING THE SAME ABBREVIATIONS SELECT THE TOWNS TO BE LINKED
LA PAZ,ORURO*,SUCRE*,POTOSI,COCHAB,S CRUZ
CONFIRMING YOUR CHOICES:
LA PAZ ORURO* SUCRE* POTOSI COCHAB S CRUZ

ARE THESE NAMES RECEIVED CORRECTLY?
IF YES TYPE 1 ELSE 2
1

HOW MANY SUBCENTERS ARE TO BE FED FROM EACH MAIN CENTER?
5

THE NEXT CENTER FROM LA PAZ IS ORURO*   119.MILES AWAY
AFTER THAT
THE NEXT CENTER FROM LA PAZ IS COCHAB   133.MILES AWAY
IF YOU WISH TO COMMUNICATE DIRECTLY FROM
LA PAZ TO COCHAB TYPE 1,ELSE 2
2
IS THERE A ETV BROADCAST STATION IN LA PAZ
1(YES),2(NO)
1
HOW MANY VIDEO CHANNELS ARE TO BE BROADCAST?
2
HOW MANY VIDEO CHANNELS ARE NEEDED BETWEEN
LA PAZ-ORURO*?
1
```

```
IS THERE A TV LINK BETWEEN
LA PAZ-ORURO*?
TYPE 1 FOR YES, 2 FOR NO
2

HOW MANY HOURS PER WEEK ARE GENERATED AT:
LA PAZ
66.5
THIS TAPE LIBRARY IS AT THE MAIN CENTER
IT AMOUNTS TO      132.3399999 $ THOUSANDS
THE ANNUAL COST OF MICROWAVE IS ($THOUSANDS)
 167.9
THIS IS THE LAST INVESTMENT
CENTER-CENTER BR.ST($M) TV CH MICRO($M) AN$MI(M) TPTR($) INV($K)
LA PAZ-ORURO*      0.926    1      1.120     0.167  564.09 132.339
DO YOU WISH TO INCLUDE THESE NUMBERS IN THE COST SUMMARY?
TYPE 1 (YES), 2(NO)
1

THIS IS THE SUMMARY SO FAR

   FIRST COST ($ MILLIONS)            ANNUAL COST ($ MILLIONS)
BR.STATIONS  MICROWAVE TAPE LIBR.  MICROWAVE TAPE TR.(TRUCK) LIBR.

    0.926      1.120      0.132          0.167  0.000564       0.006

WE MOVE TO
ORURO*

THE NEXT CENTER FROM ORURO* IS COCHAB  115.MILES AWAY
AFTER THAT
THE NEXT CENTER FROM ORURO* IS POTOSI  175.MILES AWAY
IF YOU WISH TO COMMUNICATE DIRECTLY FROM
ORURO* TO POTOSI TYPE 1,ELSE 2
2
IS THERE A ETV BROADCAST STATION IN ORURO*
1(YES),2(NO)
2
HOW MANY VIDEO CHANNELS ARE TO BE BROADCAST?
1
HOW MANY VIDEO CHANNELS ARE NEEDED BETWEEN
ORURO*-COCHAB?
1
IS THERE A TV LINK BETWEEN
ORURO*-COCHAB?
TYPE 1 FOR YES, 2 FOR NO
2
```

```
4 MONTH INVENTORY OF TAPE AMOUNTS TO:
   23.020 DOLLARS (1000)
THE ANNUAL COST OF MICROWAVE IS ($THOUSANDS)
 167.9
THIS IS THE LAST INVESTMENT
CENTER-CENTER BR.ST($M) TV CH MICRO($M) AN$MI(M) TPTR($) INV($K)
ORURO*-COCHAB      0.958    1      1.120     0.167  545.87  23.020
DO YOU WISH TO INCLUDE THESE NUMBERS IN THE COST SUMMARY?
TYPE 1 (YES), 2(NO)
1

THIS IS THE SUMMARY SO FAR

   FIRST COST ($ MILLIONS)            ANNUAL COST ($ MILLIONS)
BR.STATIONS  MICROWAVE TAPE LIBR.  MICROWAVE TAPE TR.(TRUCK) LIBR.

    1.884      2.240      0.155          0.335  0.001109        0.012

WE MOVE TO
COCHAB

THE NEXT CENTER FROM COCHAB IS SUCRE*  147.MILES AWAY
AFTER THAT
THE NEXT CENTER FROM COCHAB IS POTOSI  160.MILES AWAY
IF YOU WISH TO COMMUNICATE DIRECTLY FROM
COCHAB TO POTOSI TYPE 1,ELSE 2
2
IS THERE A ETV BROADCAST STATION IN COCHAB
1(YES),2(NO)
2
HOW MANY VIDEO CHANNELS ARE TO BE BROADCAST?
1
HOW MANY VIDEO CHANNELS ARE NEEDED BETWEEN
COCHAB-SUCRE*?
1
IS THERE A TV LINK BETWEEN
COCHAB-SUCRE*?
TYPE 1 FOR YES, 2 FOR NO
2

4 MONTH INVENTORY OF TAPE AMOUNTS TO:
   23.020 DOLLARS (1000)
THE ANNUAL COST OF MICROWAVE IS ($THOUSANDS)
 209.9
THIS IS THE LAST INVESTMENT
CENTER-CENTER BR.ST($M) TV CH MICRO($M) AN$MI(M) TPTR($) INV($K)
COCHAB-SUCRE*      0.958    1      1.399     0.209  694.33  23.020
DO YOU WISH TO INCLUDE THESE NUMBERS IN THE COST SUMMARY?
TYPE 1 (YES), 2(NO)
1
```

```
THIS IS THE SUMMARY SO FAR

   FIRST COST ($ MILLIONS)              ANNUAL COST ($ MILLIONS)
BR.STATIONS  MICROWAVE TAPE LIBR.  MICROWAVE TAPE TR.(TRUCK) LIBR.

    2.842       3.639      0.178          0.545  0.001804       0.018

WE MOVE TO
SUCRE*

THE NEXT CENTER FROM SUCRE* IS POTOSI    76.MILES AWAY
AFTER THAT
THE NEXT CENTER FROM SUCRE* IS S CRUZ   177.MILES AWAY
IF YOU WISH TO COMMUNICATE DIRECTLY FROM
SUCRE* TO S CRUZ TYPE 1,ELSE 2
1
IS THERE A ETV BROADCAST STATION IN SUCRE*
1(YES),2(NO)
2
HOW MANY VIDEO CHANNELS ARE TO BE BROADCAST?
1
HOW MANY VIDEO CHANNELS ARE NEEDED BETWEEN
SUCRE*-S CRUZ?
1
IS THERE A TV LINK BETWEEN
SUCRE*-S CRUZ?
TYPE 1 FOR YES, 2 FOR NO
2

4 MONTH INVENTORY OF TAPE AMOUNTS TO:
    23.020 DOLLARS (1000)
THE ANNUAL COST OF MICROWAVE IS ($THOUSANDS)
 293.9
THIS IS THE LAST INVESTMENT
CENTER-CENTER BR.ST($M) TV CH MICRO($M) AN$MI(M) TPTR($) INV($K)
SUCRE*-S CRUZ     0.958   1      1.959     0.293  833.84  23.020
DO YOU WISH TO INCLUDE THESE NUMBERS IN THE COST SUMMARY?
TYPE 1 (YES), 2(NO)
1

THIS IS THE SUMMARY SO FAR

   FIRST COST ($ MILLIONS)              ANNUAL COST ($ MILLIONS)
BR.STATIONS  MICROWAVE TAPE LIBR.  MICROWAVE TAPE TR.(TRUCK) LIBR.

    3.800       5.599      0.201          0.839  0.002638       0.023
```

```
IS THERE A ETV BROADCAST STATION IN SUCRE*
1(YES),2(NO)
2
HOW MANY VIDEO CHANNELS ARE TO BE BROADCAST?
1
HOW MANY VIDEO CHANNELS ARE NEEDED BETWEEN
SUCRE*-POTOSI?
1
IS THERE A TV LINK BETWEEN
SUCRE*-POTOSI?
TYPE 1 FOR YES, 2 FOR NO
2

4 MONTH INVENTORY OF TAPE AMOUNTS TO:
    23.020 DOLLARS (1000)
IF THIS IS THE LAST STATION IN THE CHAIN- ESTABLISH THE NEXT
CONNECTION SO THAT THE COST OF STATION AND OF TAPE LIBRARY
ARE COUNTED IN THE SUMMARY
THE ANNUAL COST OF MICROWAVE IS ($THOUSANDS)
 125.9
THIS IS THE LAST INVESTMENT
CENTER-CENTER BR.ST($M) TV CH MICRO($M) AN$MI(M) TPTR($) INV($K)
SUCRE*-POTOSI     0.958    1      0.839    0.125  361.03  23.020
DO YOU WISH TO INCLUDE THESE NUMBERS IN THE COST SUMMARY?
TYPE 1 (YES), 2(NO)
1
IS THIS THE LAST BROADCAST STATION IN THE CHAIN?
IF YES TYPE 1,ELSE 2
2

THIS IS THE SUMMARY SO FAR

   FIRST COST ($ MILLIONS)               ANNUAL COST ($ MILLIONS)
BR.STATIONS  MICROWAVE TAPE LIBR.  MICROWAVE TAPE TR.(TRUCK) LIBR.

    4.758       6.439     0.224          0.965  0.002999         0.029

WE MOVE TO
POTOSI

THE NEXT CENTER FROM POTOSI IS COCHAB  160.MILES AWAY
AFTER THAT
THE NEXT CENTER FROM POTOSI IS ORURO*  175.MILES AWAY
IF YOU WISH TO COMMUNICATE DIRECTLY FROM
POTOSI TO ORURO* TYPE 1,ELSE 2
2
```

```
IS THERE A ETV BROADCAST STATION IN POTOSI
1(YES),2(NO)
2
HOW MANY VIDEO CHANNELS ARE TO BE BROADCAST?
1
HOW MANY VIDEO CHANNELS ARE NEEDED BETWEEN
POTOSI-COCHAB?
1
IS THERE A TV LINK BETWEEN
POTOSI-COCHAB?
TYPE 1 FOR YES, 2 FOR NO
1

4 MONTH INVENTORY OF TAPE AMOUNTS TO:
    23.020 DOLLARS (1000)
IF THIS IS THE LAST STATION IN THE CHAIN- ESTABLISH THE NEXT
CONNECTION SO THAT THE COST OF STATION AND OF TAPE LIBRARY
ARE COUNTED IN THE SUMMARY
THE ANNUAL COST OF MICROWAVE IS ($THOUSANDS)
  26.9
THIS IS THE LAST INVESTMENT
CENTER-CENTER BR.ST($M) TV CH MICRO($M) AN$MI(M) TPTR($) INV($K)
POTOSI-COCHAB     0.958   1      0.130    0.026  755.63  23.020
DO YOU WISH TO INCLUDE THESE NUMBERS IN THE COST SUMMARY?
TYPE 1 (YES), 2(NO)
1
IS THIS THE LAST BROADCAST STATION IN THE CHAIN?
IF YES TYPE 1,ELSE 2
1
THE ONLY EXPENSE  WILL BE BROADCAST STATION AND LIBRARY

THIS IS THE SUMMARY SO FAR

    FIRST COST ($ MILLIONS)              ANNUAL COST ($ MILLIONS)
BR.STATIONS  MICROWAVE TAPE LIBR.  MICROWAVE TAPE TR.(TRUCK) LIBR.

    5.716       6.619      0.247        0.965  0.002999         0.035
```

Maps of Latin American Telecommunication Nets

Figures 3 through 12 present maps of the Latin American countries studied, showing the location of transmitting stations interconnected for purposes of running the computer program on terrestrial transmission. Main centers for the origination of educational programs are indicated by place names in capital letters. Cities in lower case are retransmission points. The stations and their interconnections conform, wherever possible, to the country's own plans for extending the telecommunications network.

The Rebroadcast and Direct Broadcast Satellite Programs

The computer programs for the rebroadcast and the direct broadcast satellites share a number of common features. The approach adopted for both was to calculate the system costs in terms of the user requirements or desires. No attempt was made to optimize either system, because of the difficulty of: (1) specifying what is to be optimized and (2) computing of some 10 variables, often connected by nonlinear equations. Further, optimizing the design of the satellite system was not a primary objective of the study.

Interpretation of Printouts: Basic Sequence

The sequence through which both programs proceed is as follows:

1. User requirements, receiver quality, and antenna size chosen dictate the incident power flux required at the antenna face.
2. Given the orbital height, the power flux emerging from the satellite is calculated.
3. Given the desired area of earth coverage (hence the satellite antenna gain), the satellite power output is calculated.

FIGURE 3

CENTRAL AMERICA

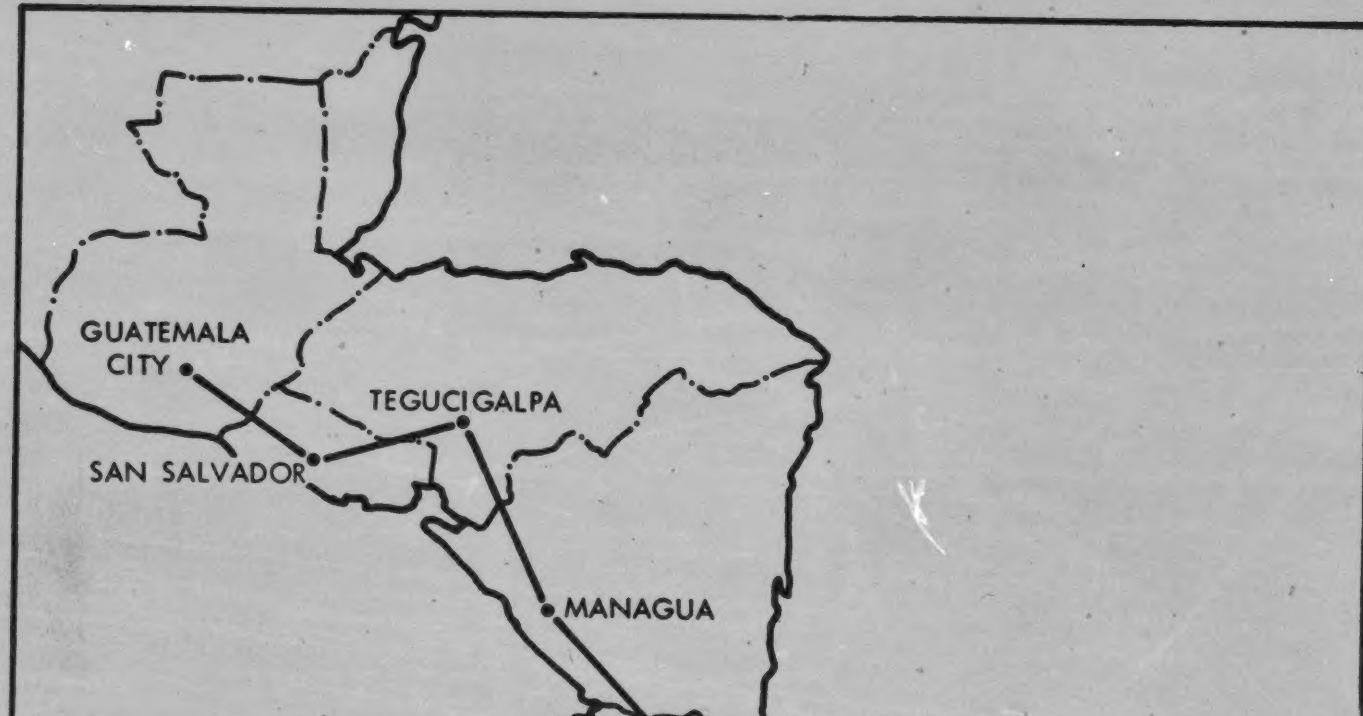
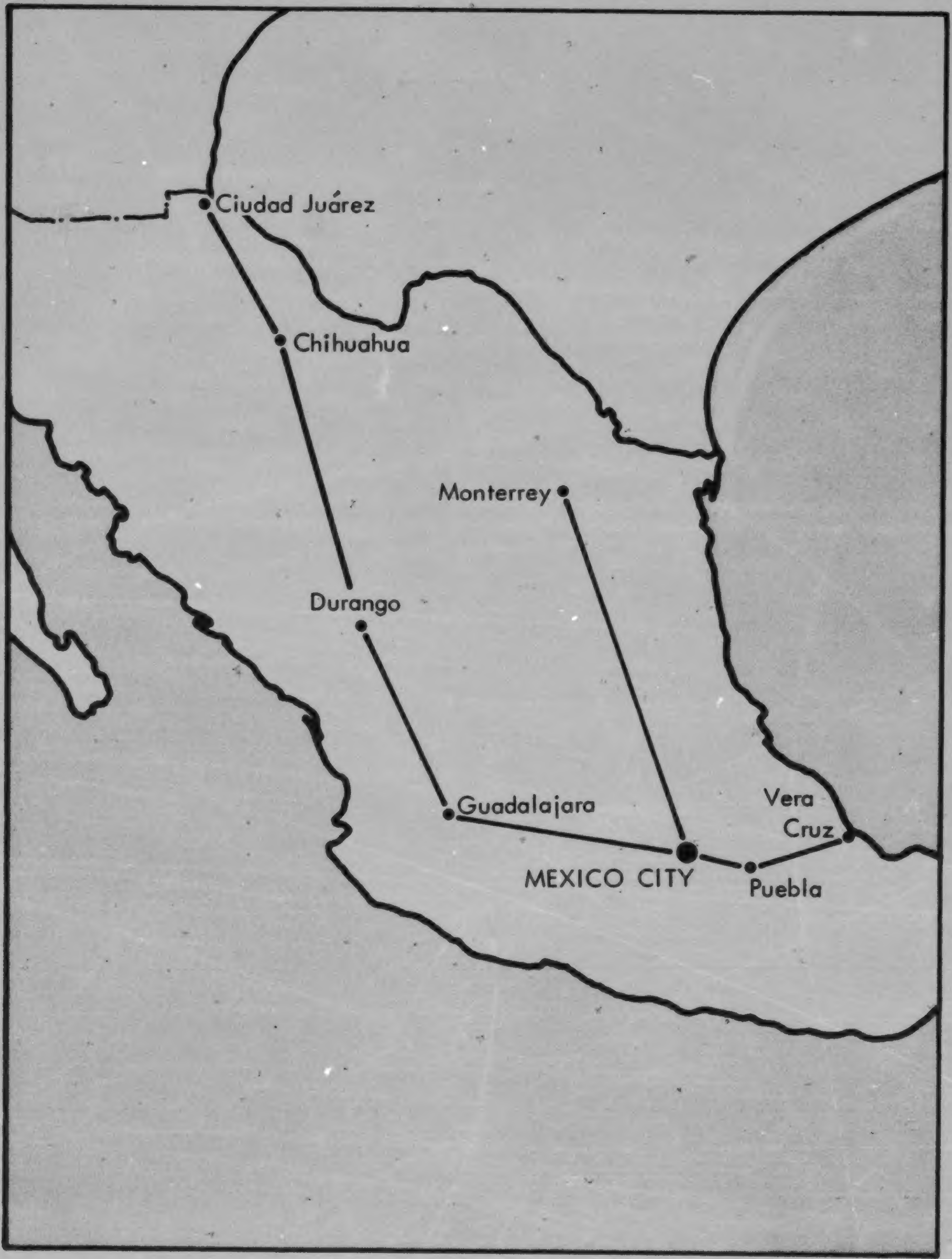

GUATEMALA CITY
TEGUCIGALPA
SAN SALVADOR
MANAGUA
SAN JOSE
PANAMA CITY

FIGURE 4

MEXICO



Ciudad Juárez
Chihuahua
Monterrey
Durango
Guadalajara
Vera Cruz
MEXICO CITY
Puebla

FIGURE 5

COLOMBIA

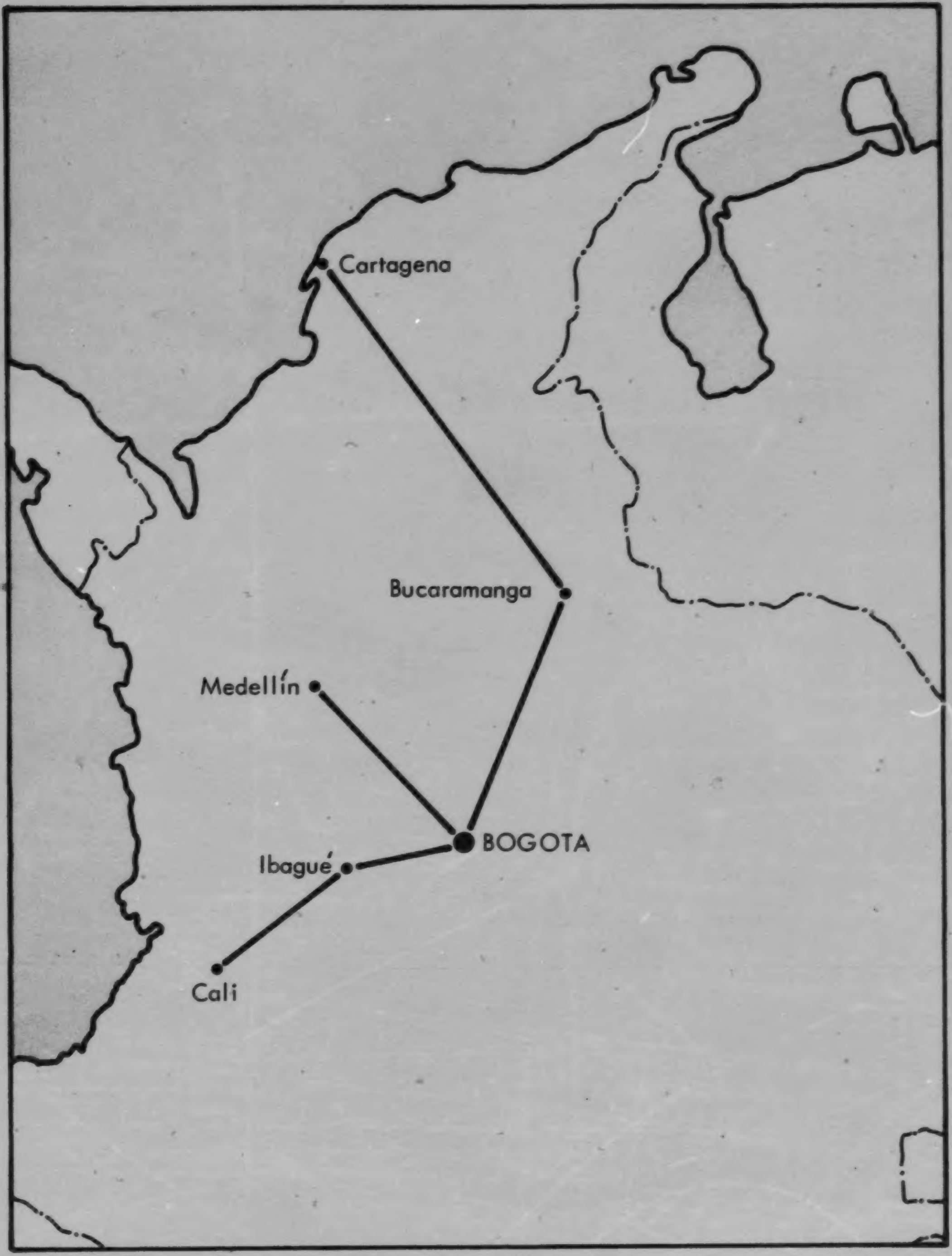

Cartagena
Bucaramanga
Medellín
BOGOTA
Ibagué
Cali

FIGURE 6

VENEZUELA

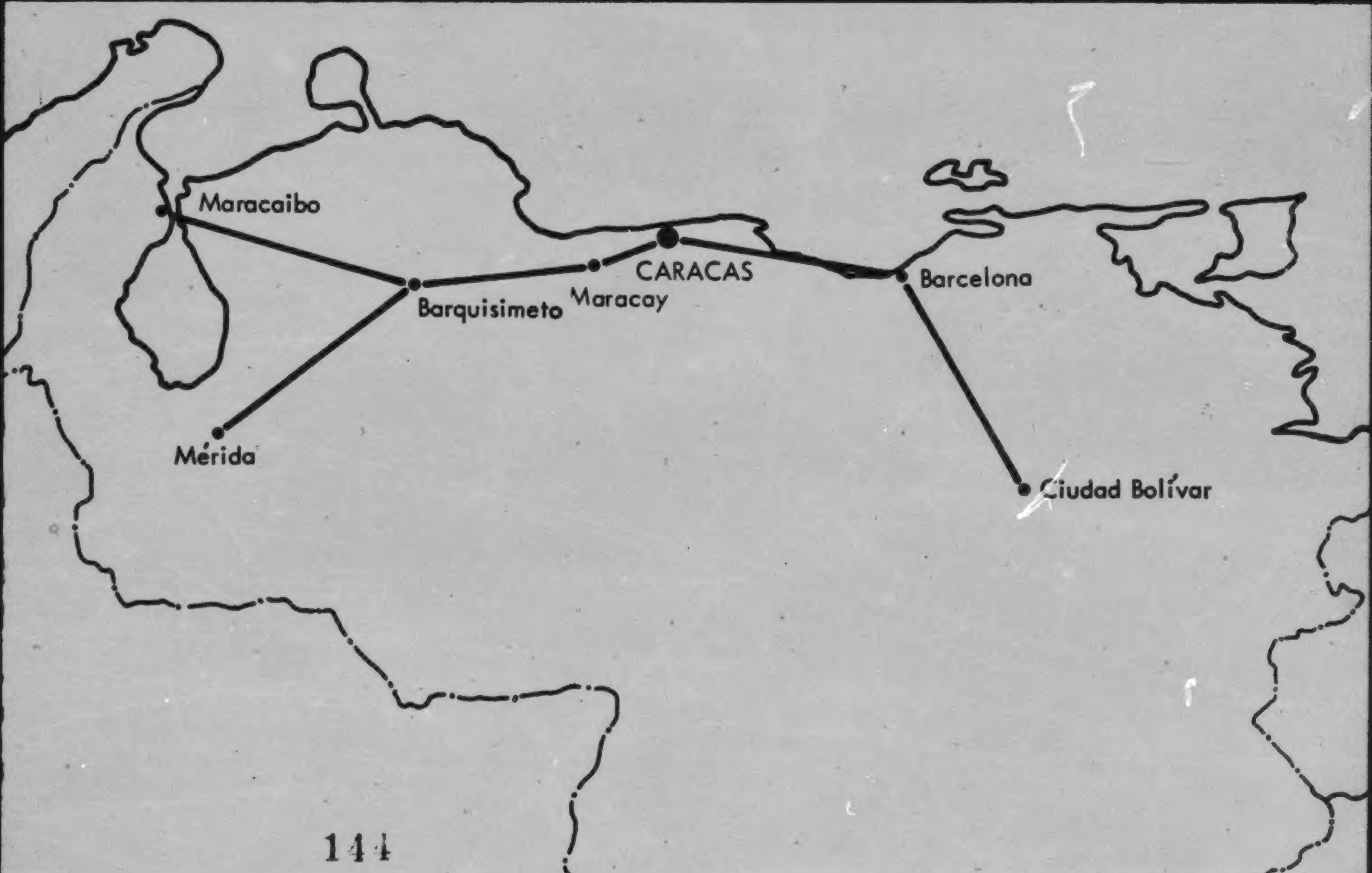

Maracaibo
CARACAS
Barcelona
Barquisimeto
Maracay
Mérida
Ciudad Bolívar

FIGURE 7

BRAZIL

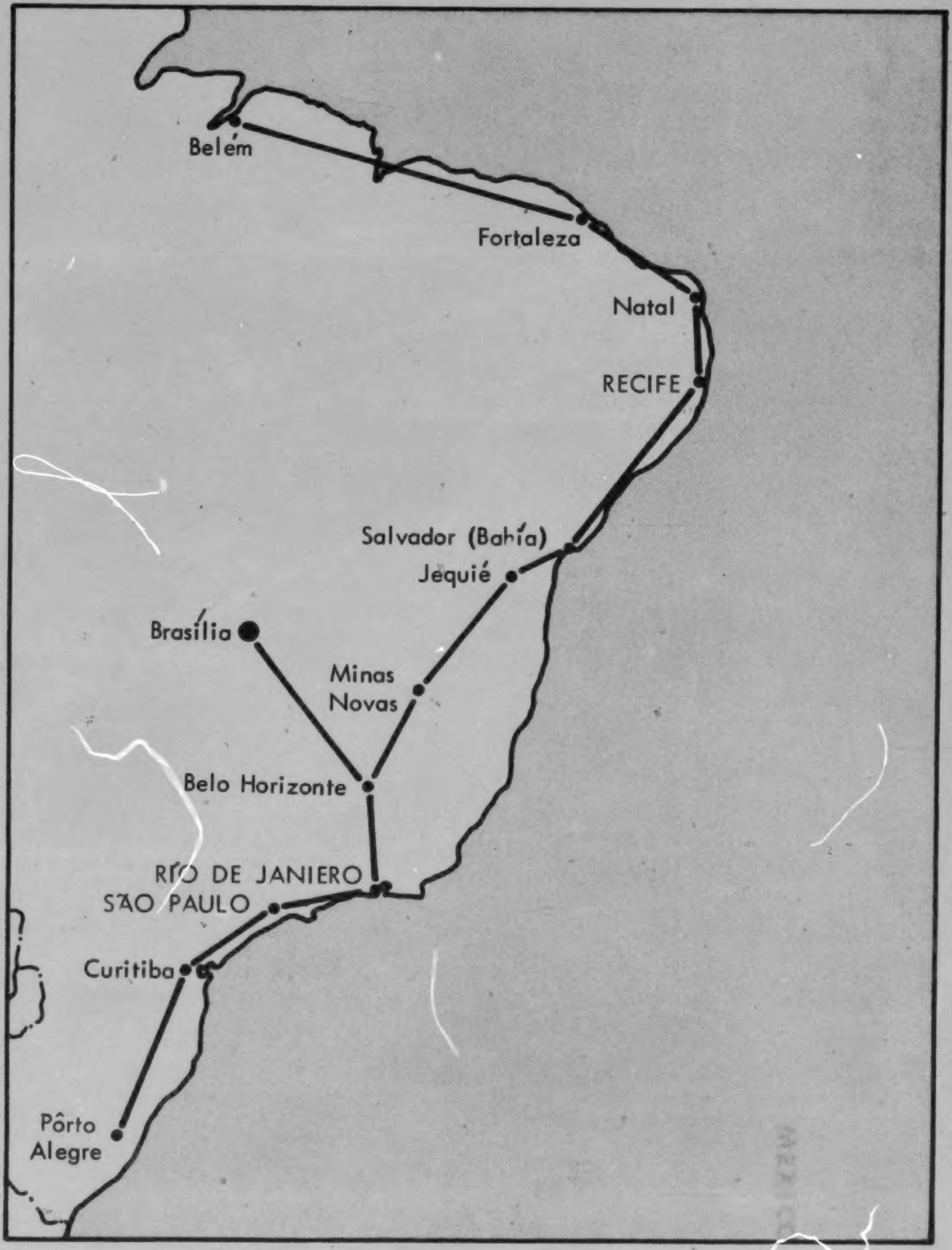

Belém
Fortaleza
Natal
RECIFE
Salvador (Bahía)
Jequié
Brasília
Minas
Novas
Belo Horizonte
RÍO DE JANIERO
SÃO PAULO
Curitiba
Pôrto
Alegre

FIGURE 8

ARGENTINA

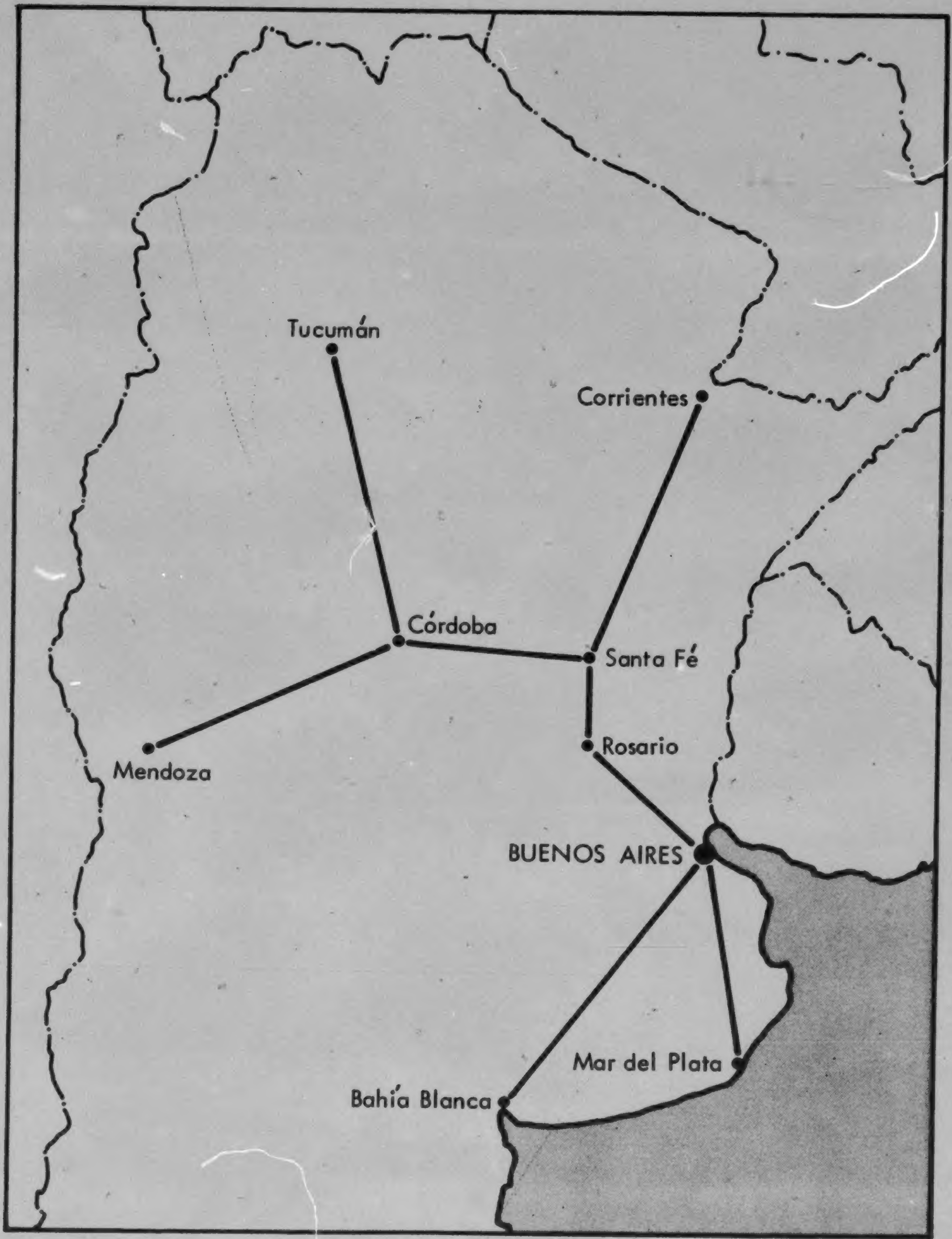

Tucumán
Corrientes
Córdoba
Santa Fé
Rosario
Mendoza
BUENOS AIRES
Mar del Plata
Bahía Blanca

FIGURE 9

BOLIVIA

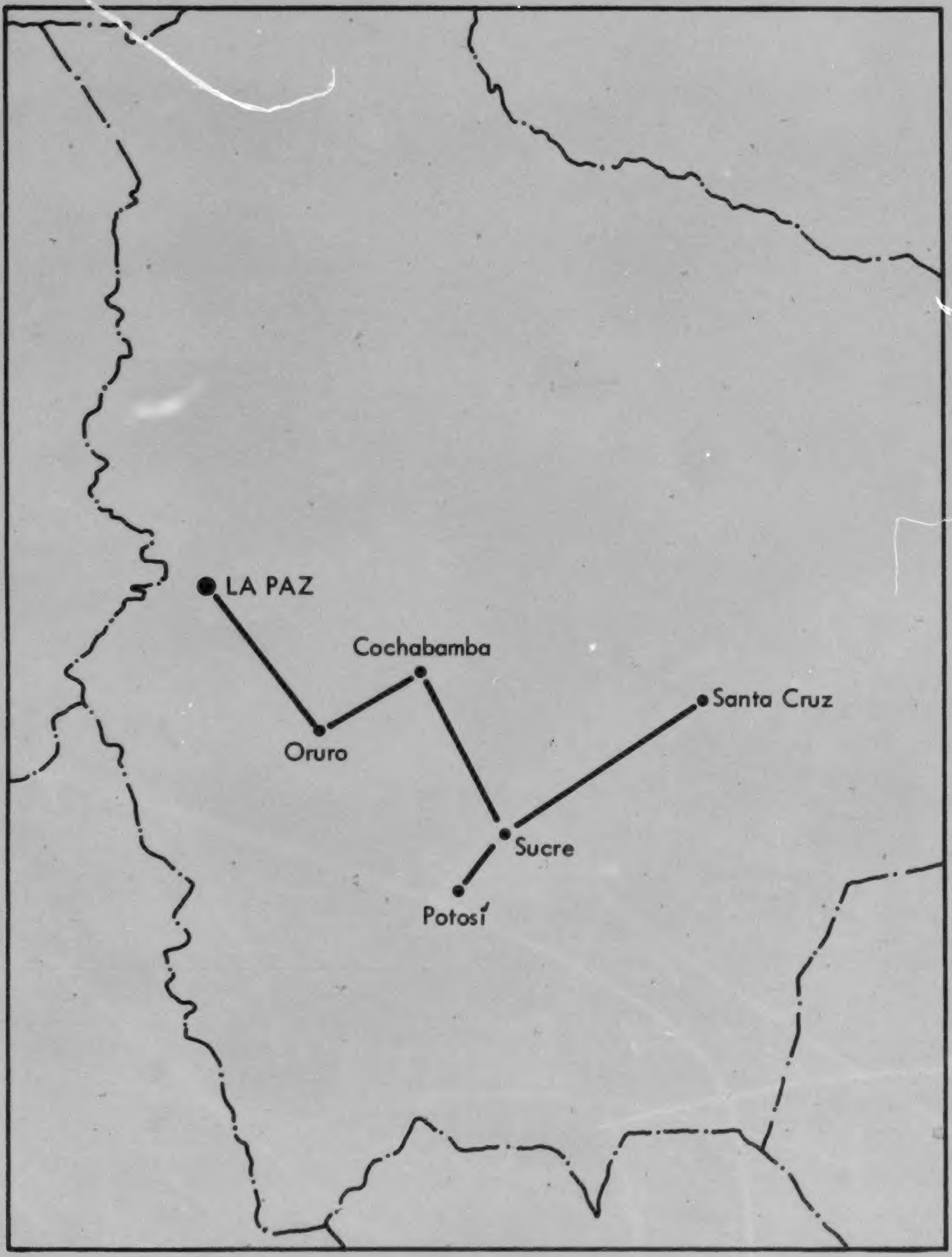

LA PAZ
Cochabamba
Oruro
Santa Cruz
Sucre
Potosí

FIGURE 10

CHILE

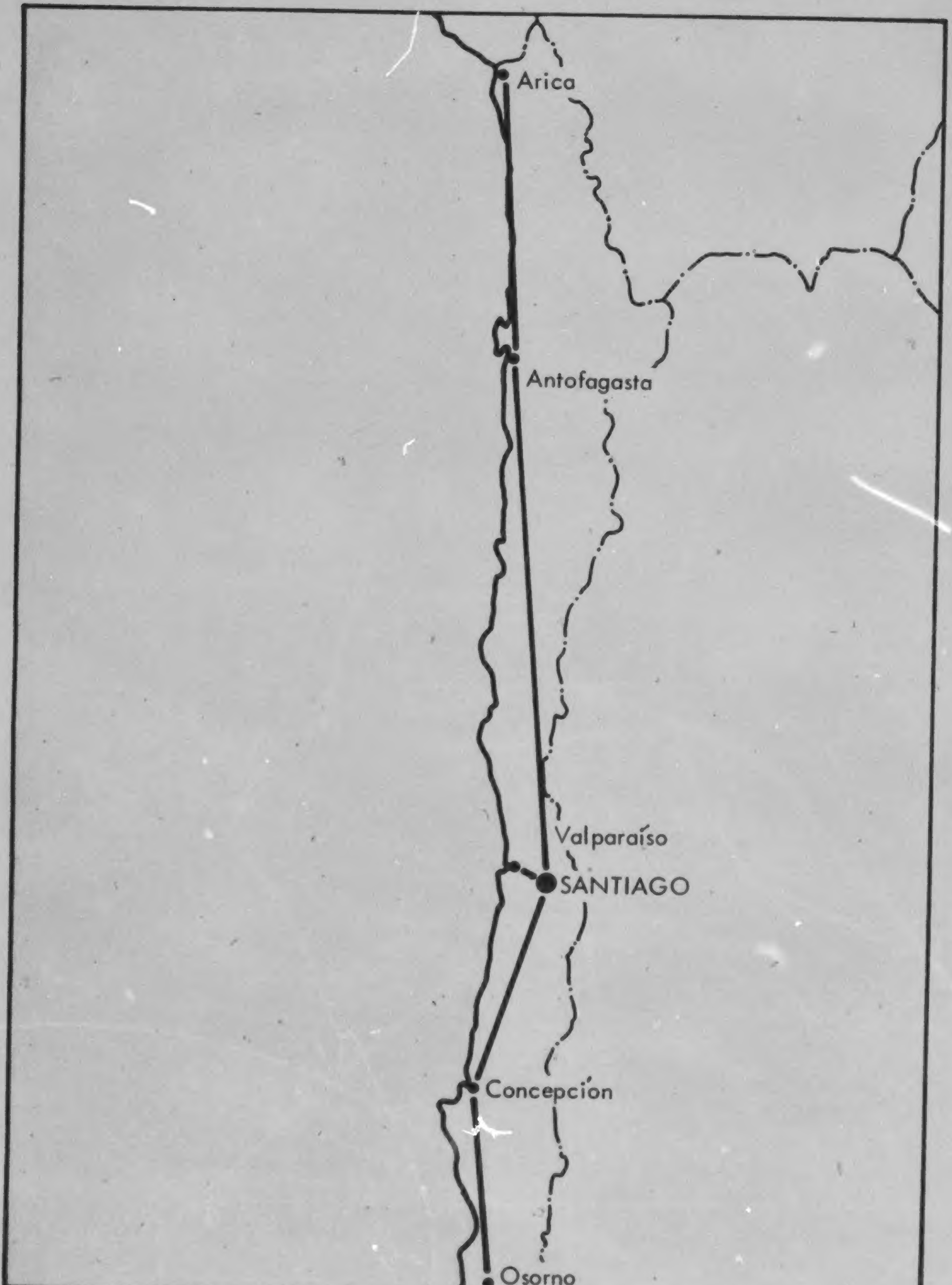

Arica
Antofagasta
Valparaíso
SANTIAGO
Concepcion
Osorno

FIGURE 11

PERU

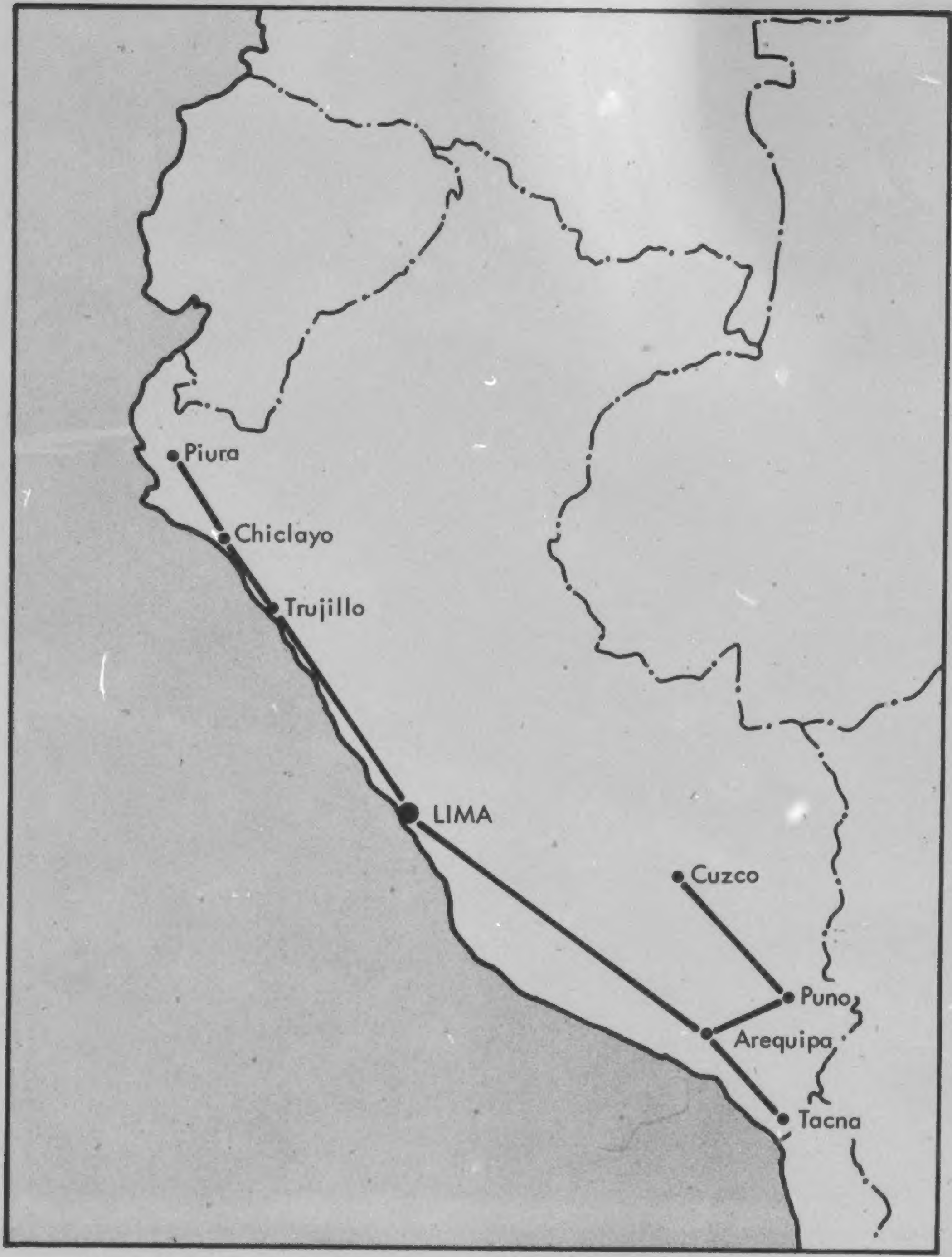
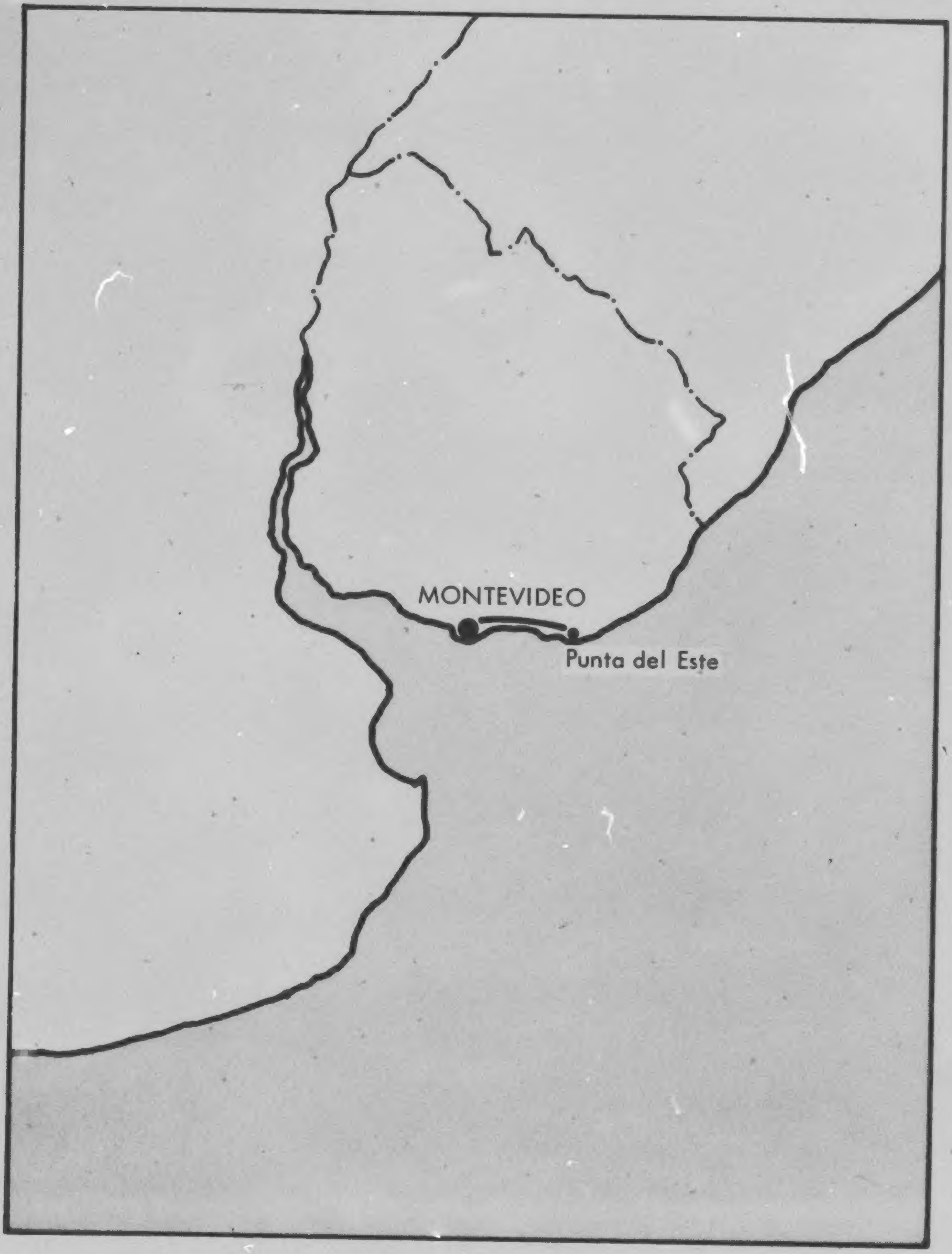

Piura
Chiclayo
Trujillo
LIMA
Cuzco
Puno
Arequipa
Tacna

FIGURE 12

URUGUAY


MONTEVIDEO
Punta del Este

4. From the satellite power, antenna gain, and number of transponders (one for each television channel), the satellite weight at launch is calculated.
5. The smallest booster that is capable of lifting that weight in the orbit is chosen.
6. The earth transmitter power incident at the satellite is calculated (by an assumption of satellite noise figure and antenna gain).
7. The earth transmitter power is calculated.
8. The cost of the receiving and transmitting equipments is calculated. Costs of the antenna, installation, and so forth, are added, to provide a complete earth station cost.
9. Annual expenditures (for internally and externally purchased hardware and internal and external manpower) are calculated and printed out by year and category.

Interpretation of Printouts: Distinguishing Characteristics

The above sequence outlines the basic approach for both the rebroadcast and the direct broadcast satellite programs; however, certain differences between the two programs do exist. The more significant of these are described below.

Distinguishing characteristics of the rebroadcast satellite program are the following:

- System noise temperature describes the quality of the receiver system (for receiver itself, antenna feeder contribution, and skynoise contribution, but not the rain-reflected noise).

- Peak-to-peak to RMS noise ratio and the number of video channels required determine the end quality of the television picture and the number of video channels to be transmitted by the satellite.
- Program channels are sound channels accompanying the video signal. A separate radio carrier is allowed for additional sound channels. These are then treated as though they were telephone channels (except for wider base bandwidth).
- An option is allowed for further telephone channels, to let the educators converse over their own system. The effect of this added convenience on system characteristics is minimal.
- Earth stations requiring telephony are either stations transmitting television or stations transmitting television and telephony.
- Receive-only stations have television equipment for reception only --they can transmit neither by telephones nor television.
- Satellite bandwidth is the total bandwidth at the satellite. It is printed so that it can be compared with the maximum bandwidth allowed by the ITU.
- In the calculation of station costs, the important cost parameter is the number of television channels received by each station-- hence the question.

Distinguishing characteristics of the direct broadcast satellite program are the following:

- Receiver noise figure is used, rather than receiver temperature, because (particularly at UHF) this is the common language.

- The environment needs to be specified, because at UHF the indigenous noise is of importance and depends on the environment.
- Number of receiver stations refers to the number of sets, suitably modified for direct reception from a satellite. For reception at UHF, the noise figure of the mixer is improved, as required. For reception at SHF, the cost of the local oscillator is added.
- Sometimes more than one satellite can be launched by one booster. The program allows the user to take advantage of this in the design of a system.
- Receiver station components costed are: antenna, pre-amplifier/mixer, and local oscillator and antenna feed. The television set itself is costed in the educational support program.

The computer runs for the rebroadcast satellite and the direct broadcast satellite that would serve the northern countries are presented in the following pages. Printouts for the other countries are contained in Appendix D. Many more runs were made, based on different combinations of earth and satellite power, different procurement quantities, and other parameters. Only the runs that appeared most feasible are printed here.

REBROADCAST SATELLITE

CENTRAL AMERICA
MEXICO
COLOMBIA
VENEZUELA

```
>RUN

A.J.LIPINSKI  STANFORD RESEARCH INSTITUTE
THE REBROADCAST INSTRUCTIONAL SATELLITE

TYPE IN THE YEAR IN WHICH PROGRAM IS TO START
ANY YEAR FROM 1970 TO 1979
1972
TYPE-IN SYSTEM NOISE TEMPERATURE IN DEGREES
80 IS INTELSAT STANDARD,300 IS CHEAPER,1000 PASSABLE
300
REQUIRED PEAK TO PEAK/RMS RATIO,NO OF VIDEO CHANNELS
EXAMPLE 50,3  (45=ACCEPTABLE,50=GOOD,55=EXCELLENT)
55,12
NUMBER OF PROGRAM CHANNELS PER VIDEO
ONE FOR EACH MAJOR LANGUAGE?
1
NUMBER OF VOICE CHANNELS FOR OTHER USES
6
```

REBROADCAST SATELLITE

CENTRAL AMERICA
MEXICO
COLOMBIA
VENEZUELA

```
TYPE-IN ANTENNA DIA FT,DOWNLINK FREQ. MH
15,4000
ORBIT-IF SYNCHR.TYPE 1,OTHERWISE HT. IN STAT.MILES
1
SIZE OF COVERAGE (MILES X MILES) ?
EXAMPLE 1000,4000
2500,4500
THE ANTENNA BEAMWIDTH IS
 11.8 DEGREES
TYPE-IN NO OF EARTH STATIONS REQUIRING TELEPHONY
10
NO OF RECEIVE ONLY STATIONS?
17

SAT POWER    .
WATTS
   284.5
SATELLITE WEIGHT- POUNDS
   831.5
SAT COST $MILLIONS
     7.2

BOOSTER ATLAS-AG-BII
BOOSTER CAN LIFT   3      SATELLITES
NOTE-LAUNCH COST INCLUDES TOTAL SAT. COMPLEMENT
UNLESS SPECIFIED (LATER ON),ALSO ONE BOOSTER IS ASSUMED IN RESERVE
THE BOOSTER COSTS ($ MILLIONS FOR ONE):
     8.4

SAT BWIDTH-MH
   509.5

TYPE-IN UP FREQ-MH
6000
```

REBROADCAST SATELLITE

CENTRAL AMERICA
MEXICO
COLOMBIA
VENEZUELA

```
REQUIRED TX POWER FOR TV TRANSMISSION OF ONE CHANNEL -WATTS
   214.6
IF ONE SATELLITE IS NEEDED TYPE 1,IF MORE TYPE 2
2
ON THE AVERAGE,HOW MANY VIDEO CHANNELS ARE NEEDED PER STATION
4

COST OF ONE TX-RX STATION,ITS RECEIVE AND TRANSMIT EQPT. $ MILLIONS
  0.640  0.239  0.083
COST OF RECEIVE ONLY STATION ITS RECEIVE EQPT. AND ANTENNA $ MILLIONS
  0.532  0.233  0.035
ALL STATIONS COST $ MILLIONS
 15.461
TOTAL SYSTEM COST $ MILLIONS
 52.804
ANNUAL EXPENDITURES BY CATEGORY AND YEARS $MILLIONS

         1970 1971 1972 1973 1974 1975 1976 1977 1978 1979

EXT HW   0.0  0.0 50.8  0.0  0.0 30.1  0.0  0.0 30.1  0.0
INT HW   0.0  0.0  3.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
EXT MP   0.0  0.0  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
INT MP   0.0  0.0  1.5  1.5  1.5  1.5  1.5  1.5  1.5  1.5
TOT IN   0.0  0.0  4.6  1.5  1.5  1.5  1.5  1.5  1.5  1.5
TOT EX   0.0  0.0 51.0  0.1  0.1 30.2  0.1  0.1 30.2  0.1
 TOTAL   0.0  0.0 55.6  1.7  1.7 31.8  1.7  1.7 31.8  1.7

STOPPED AT: 86.11
```

DIRECT BROADCAST SATELLITE
OPTION II (75,000 SETS)

(REQUIRED FOR ALL OF LATIN AMERICA)

CENTRAL AMERICA
MEXICO
COLOMBIA
VENEZUELA

```
FORTRAN

>RUN

A.J.LIPINSKI STANFORD RESEARCH INSTITUTE
THE DIRECT BROADCAST INSTRUCTIONAL SATELLITE

TYPE IN THE YEAR IN WHICH PROGRAM IS TO START
ANY YEAR FROM 1970 TO 1979
1975
ANTENNA DIA (FT),DOWNLINK FR MHERTZ
15,4000

TYPE-IN RECEIVER NOISE FIGURE IN DB
THE RANGE IS FROM 4DB(EXCELLENT) TO 13 DB(POOR)
4
SPECIFY RX ENVIRONMENT
TYPE (1) COUNTRYSIDE (2) SUBURBS (3)TOWNS
TYPE HIGHER NUMBER IF MORE THAN ONE INVOLVED
I.E. TYPE EITHER 1, 2 OR 3
3
REQUIRED PEAK TO PEAK/RMS RATIO,NO OF VIDEO CHANNELS
EXAMPLE 50,3  (45=ACCEPTABLE,50=GOOD,55=EXC.)
55,12
NUMBER OF PROGRAM CHANNELS PER VIDEO
1
RF BANDWIDTH-MH
    501.6
```

DIRECT BROADCAST SATELLITE
OPTION II (75,000 SETS)

(REQUIRED FOR ALL OF LATIN AMERICA)

CENTRAL AMERICA
MEXICO
COLOMBIA
VENEZUELA

```
ORBIT-IF SYNCHR.TYPE 1,OTHERWISE HT. IN STAT.MILES
1
SIZE OF COVERAGE (MILES X MILES) ?
EXAMPLE 1000,4000
2500,4500
THE ANTENNA BEAMWIDTH IS
 11.8 DEGREES

SAT POWER
WATTS
   437.9
SATELLITE WEIGHT- POUNDS
   949.9
SAT COST $MILLIONS
     8.3

BOOSTER ATLAS-AG-BII
BOOSTER CAN LIFT   2      SATELLITES
NOTE-LAUNCH COST INCLUDES TOTAL SAT. COMPLEMENT
UNLESS SPECIFIED (LATER ON),ALSO ONE BOOSTER IS ASSUMED IN RESERVE
THE BOOSTER COSTS ($ MILLIONS FOR ONE):
     8.4

NUMBER OF RECEIVER STATIONS
TO BE REACHED AT THE START AND THE END OF PERIOD
10000,75000
SAT BWIDTH-MH
   561.6
```

DIRECT BROADCAST SATELLITE
OPTION II (75,000 SETS)

(REQUIRED FOR ALL OF LATIN AMERICA)

CENTRAL AMERICA
MEXICO
COLOMBIA
VENEZUELA

```
IF ONE SATELLITE IS NEEDED TYPE 1,IF MORE TYPE 2
1
COST OF TUNER OR PRE-AMP BOUGHT IN QUANTITY
    225.4

HOW MANY SUPPLIERS WOULD PROVIDE ANTENNAS:?
1
COST OF AN ANTENNA BOUGHT IN QUANTITY
DOLLARS
    311.8
COST OF PRE-AMP AND FEED (DOLLARS)
    269.6

COST OF ONE STATION $ MILLIONS
   0.000697
INITIALLY THE STATIONS COST ($ MILLIONS)
      6.9

TYPE ANNUAL SALARY,TRANSPORT EXPENSE
MAINTENANCE TECHNICIAN
3500,1500
TOTAL SYSTEM COST $ MILLIONS
     32.1
ANNUAL EXPENDITURES BY CATEGORY AND YEARS $MILLIONS

         1970 1971 1972 1973 1974 1975 1976 1977 1978 1979

EXT HW   0.0  0.0  0.0  0.0  0.0 25.1  0.0  0.0 16.7  0.0
INT HW   0.0  0.0  0.0  0.0  0.0  6.9  4.5  7.5 12.5 20.7
EXT MP   0.0  0.0  0.0  0.0  0.0  0.0  0.1  0.1  0.3  0.5
INT MP   0.0  0.0  0.0  0.0  0.0  0.4  0.8  1.3  2.2  3.7
TOT IN   0.0  0.0  0.0  0.0  0.0  7.4  5.3  8.9 14.7 24.4
TOT EX   0.0  0.0  0.0  0.0  0.0 25.2  0.1  0.1 17.1  0.5
 TOTAL   0.0  0.0  0.0  0.0  0.0 32.7  5.5  9.1 31.8 24.9
STOPPED AT: 86.12
```

VI SYSTEM COMPARISONS

Common Requirements for Comparing Alternative Modes

The computer printouts yield cost elements that can be combined to form complete systems conforming to the four basic distribution modes: truck or air shipment of video tapes (A); microwave transmission (B); rebroadcast satellite (C); and direct broadcast satellite (D). The four modes have many cost elements in common, but some that are unique to only one or two.

For system costs to be truly comparable, all systems should be capable of providing the same level of service--in this case, of meeting the demand expressed in viewer hours per week in Section IV. Certain of the system alternatives have advantages for particular patterns of demand; for example, it is clear at the outset that the direct broadcast satellite can offer flexibility and perhaps cost advantages when used to reach highly dispersed populations that are not easily served by conventional television transmitters. Before such specialized requirements could be considered, however, it was necessary to compare the alternative distribution systems against a common demand.

The one exception to the common level of service to which all four systems were addressed concerns whether the ETV programming is to be received simultaneously or nonsimultaneously. In all of the system comparisons in this section it was assumed that in Modes B, C, and D there would be simultaneous reception within a country, but not necessarily for more than one country. It was assumed, on the other hand, that Mode A would have nonsimultaneous reception. It is believed that the procedure of using two policies with respect to simultaneous reception is defensible and necessary, for reasons that will be developed below.

Simultaneous Reception

The timeliness of live programs received simultaneously throughout Latin America has relatively little educational utility, except for an occasional event of wide interest or an outstanding lecture by a distinguished international authority. The great majority of the instructional programming considered in the demand estimates would be recorded on video tape, not produced and transmitted live. If a program is stored at all (on tape or film), it is not of great importance whether that program is received simultaneously by all points in the reception system or at a variety of times.

School calendars differ among Latin American countries. Those in the southern hemisphere generally observe an April to December schedule, while Mexico and Central America use the northern hemisphere schedule of September to June. Various school calendars within a single country exist in several countries, including Colombia, Ecuador, and some of Central America. Generally, these reflect local harvest cycles. In-country calendar differences are being gradually eliminated. Each country has its own school holidays.

Another obstacle to simultaneous regional programming is the geographical distribution of the Latin American countries among five international time zones, as shown on the following page:

International Time Zones

-8	-7	-6	-5	-4	-3
Pacific Mexico	Mountain Mexico	Central Mexico	Colombia	Argentina	Coastal Brazil
		Central America	Ecuador	Bolivia	Uruguay
			Peru	Chile	
			Panama	Paraguay	
			Westernmost Brazil	Venezuela	
				Western Brazil	

These time differences would interfere to some extent with simultaneous reception of common educational programs, although if there are to be relatively few common programs, those could probably be scheduled at hours that are convenient to the several adjacent time zones.

ETV is frequently criticized in the United States for requiring the classroom teacher to conform rigidly to a particular reception time. These critics argue that the teacher should be allowed to determine when a particular program will best complement the instructional effort.

A hierarchy of degrees of flexibility in the timing of use of instructional materials can be visualized. Ultimate flexibility would be provided by individualized programmed instruction, perhaps using advanced technology of computer-assisted terminals with audio-visual displays. Somewhat less flexible would be systems in which the timing is managed for a classroom. Audio-visual equipment at this level might include a sound-movie projector for each classroom and access to a large instructional film library. The proposed Columbia Broadcasting System equipment for visual recordings played through a television set may provide a useful alternative to the classroom film projector. Less flexibility is available in the closed-circuit television system, where teachers must agree on common scheduling. Still less flexibility exists in simultaneous reception by all sets within radius of an open-circuit television transmitter. This requires citywide or metropolitan areawide harmonizing of viewing times. For programs sent over microwave, there is need for even wider agreement on viewing times. For any of these configurations, a storage step in video taping the program for later replaying can be interposed to add flexibility of viewing time.

In opposition to the desire for maximum flexibility of classroom reception time is the position that an ETV system is also a pacing method and a means of assuring a specified standard of performance in the presentation of subject matter. By scheduling particular programs on particular days, the educational leaders can assure themselves that certain material will be covered and at a certain pace. When classroom teachers are underprepared and underqualified, there is the possibility that some instructional units about which the individual teacher is insecure may be omitted. Also, without the discipline of a tight syllabus or a television series, the teacher himself may not have the managerial skill to pace the instructional program. Supervisors and inspectors are supposed to assist teachers in such instructional management, but there are seldom enough personnel for detailed surveillance. In most Latin American countries, it would appear that simultaneous national reception would probably enhance educational results.

A plan that seems appropriate for ETV, and yet is still somewhat responsive to individual timing needs, is the practice of French ETV, in which every program is available at least twice during a one- or two-week interval. The classroom teacher can select whichever of the optional viewing times is the more effective for him. Several U.S. ETV stations also use this scheduling practice.

In summary, some degree of simultaneous reception, either for an entire country or for neighboring countries in the same time zone, may not be the handicap that the advocates of flexibility assert. Some pacing of instruction, particularly for primary and secondary education, may be in the interests of educational quality in Latin American countries. This degree of pacing is as available to sets linked by microwave distribution as it is to those linked by satellite distribution.

Country Groups

Another step must be taken to prepare for comparisons of system costs. In the case of distribution alternatives A and B, each country's system can be largely self-contained, although it is possible to interconnect microwave networks between countries. For this analysis, it was assumed that about 25 percent of the hours transmitted would be shared among countries, but this programming could either be transported by truck or aircraft or sent over microwave links. Modes C and D, however, require several of the countries to pool their efforts in the use of a common facility--the satellite and its launcher.

Technical considerations limit a single satellite to 12 video channels. The demand for channel capacity developed in Section IV suggests division of the Latin American countries into three groups, as shown in Table 19. It should be possible for the countries in Groups 1 and II to share enough of their programs to compress their 13 channels into 12 channels. Properly scheduled, the 25 percent of programs that are shared regionally would have the effect of reducing channel requirements.

Table 19

GROUPING OF SELECTED LATIN AMERICAN COUNTRIES FOR SHARING COMMUNICATION SATELLITES, CHANNELS, TRANSMITTERS, AND RECEIVERS: 1972 AND 1980

	ETV Channels		TV Transmitter Locations		No. of Receivers*	
	1972	1980	1972	1980	1972	1980
Group I						
Central America	1	3	6	6	3,720	9,455
Mexico	2	3	5	8	3,112	6,755
Colombia	2	4	6	6	1,880	16,718
Venezuela	2	3	3	7	960	9,596
Subtotal	7	13	20	27	9,672	42,524
Group II						
Brazil	2	4	7	13	1,080	15,793
Group III						
Argentina	1	3	1	9	50	3,863
Bolivia	1	2	1	6	10	1,092
Chile	1	3	1	6	60	4,600
Peru	1	3	3	8	175	7,071
Uruguay	1	2	1	2	40	822
Subtotal	5	13	7	31	335	17,448
Total	14	30	34	61	11,087	75,765

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* Used in organized reception of ITV programs.

Most previous investigations of the use of communications satellites for educational broadcasting have assumed that the requirement is for one or only a few channels. This study indicated otherwise. Only if all the countries would agree to 100 percent pooling of educational programs would it be possible to reduce the channel requirements to those that could be handled by one satellite. When it is considered that six videc channels are needed in the ETV system in American Samoa,* where only primary and secondary school applications exist, the total requirement of the Latin American countries for 30 channels seems reasonable.

Since two of the groups concern several countries, some basis for sharing costs would be required. Presumably this would be worked out by committees of representatives of the several countries that might be cooperating in the common facility. Satellite and launch costs were allocated among countries according to the number of ETV hours transmitted per week. (This was roughly equivalent to allocation according to the number of video channels.)

Technical Choices for the Rebroadcast and Direct Broadcast Satellite Systems

Once the demand for channels had been established, it remained to choose a plausible launch strategy and to decide on the characteristics of the satellite. This choice was basically a trade-off between excellence on the ground (determined by the sensitivity of the receivers and size of the ground station antenna) and the power at the satellite. The cheaper the receiver, the more powerful the satellite required.

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* The six channels are not, however, used to capacity.

The 61 ground stations to be connected by the rebroadcast satellite in 1980 could each be fairly expensive, yet together they could be cheaper than a powerful satellite and a heavy booster. However, if the number of receiving stations were in the thousands, as it would be using a direct broadcast satellite, it would become more economical to invest money in the satellite and save it on the ground.

There are, however, legal and technological limits to an increase in satellite power. To avoid interference in the microwave links sharing the same frequency band with the satellite, the limit on the spectral power flux density arriving at the ground from a satellite has been established.* The latest formulation of the CCIR recommendation on the subject allows for a higher power flux density reaching the ground from an overhead satellite than from a satellite seen at a low angle of elevation; it establishes a difference between the grazing (0°) elevation and a vertical (90°) equal to four times the power, or 6 dB. The computer programs developed in this study were instructed to flag a violation of the basic limit, but not the additional factor of 6 dB that is dependent on the antenna elevation angle.

Another limitation in the choice of an economical mix of satellites and ground stations arises as a result of booster selection, in that there were assumed to be only six booster sizes available.

The third limitation stems from the frequency allocations for space service. There are only two large bands of frequencies, both approximately 500 MHz wide and each capable of accommodating 12 television channels. In the United States, one band (7300-7750 MHz) is used by the federal government. If conflict of requirements between the global allocations of the ITU and the domestic allocations within the United States is to be avoided, a satellite in the U.S. commercial band (3700-4200 MHz) should be used for Latin American educational needs. To transmit 30 channels (the 1980 requirements of Latin America), three satellites would be needed. There are boosters in the U.S. inventory that can launch three or more 12-channel satellites. It would be desirable to arrive at a satellite weight such that just three satellites can be launched at once, thus minimizing launching costs. Such a desirable combination was found in the case of the rebroadcast satellite.

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* For a fuller explanation, see Working Paper No. 4, by B. R. Stack, in Vol. IV of this report series.

System Costs

The results obtained from the four computer programs for the estimated 1980 demand are presented in Table 20. (Corresponding results for the estimated 1972 demand are discussed subsequently.) Included are the initial, or capital, costs (lines 1-15) and annual operating costs (lines 16-24). The four columns for each country permit comparisons of the four distribution modes: truck or air shipment of video tapes (A); microwave transmission (B); rebroadcast satellite (C); and direct broadcast satellite (D). All four modes were assumed to meet an identical demand in terms of number and location of viewers and hours per week for each ETV application.

Simultaneous reception within a single country was assumed for Modes B, C, and D. To have assumed that these modes offered nonsimultaneous reception would have penalized them in cost comparisons with Mode A. The principal way in which these modes offset high central capital costs and

Table 20

EDUCATIONAL TELEVISION DISTRIBUTION SYSTEMS COSTS, 1980
(Thousands of Dollars)

Line	Cost Element	Central America			
		A Video Tape	B Micro-wave	C Rebroad-cast	D Direct Broadcast
	Initial Costs:				
1.	Broadcast stations total	$ 8,034	$ 8,034	$ 8,034	$ n.a.
2.	Broadcast stations, main	n.a.	n.a.	n.a.	8,034
3.	Microwave	n.a.	2,669	n.a.	n.a.
4.	Satellite and launch I	n.a.	n.a	3,000	7,850
5.	II	n.a.	n.a.	n.a.	6,050
6.	Ground stations, transmitting	n.a.	n.a.	3,840	3,840
7.	Ground stations, receiving	n.a.	n.a.	0	n.a.
8.	Tape library - total	475	n.a.	n.a.	n.a.
9.	Tape library - main	n.a.	410	410	410
10.	Studios and equipment	800	800	800	800
11.	Receivers	1,890	1,890	1,890	1,890
12.	Additions to receivers I	n.a.	n.a.	n.a.	10,690
13.	II	n.a.	n.a.	n.a.	6,600
14.	Total I	$11,199	$13,803	$17,974	$33,514
15.	II	$ n.a.	$ n.a.	$ n.a.	$28,488
	Operating Costs:				
16.	Broadcast station	1,200	1,200	1,200	1,200
17.	Microwave	n.a.	100	n.a.	n.a.
18.	Satellite and launch-II	n.a.	n.a.	625	1,370
19.	Ground station	n.a.	n.a.	356	240
20.	Tape transport	7	n.a.	n.a.	n.a.
21.	Tape library	35	6	6	6
22.	Program production, teacher training set maintenance	1,450	1,450	1,450	1,450
23.	Maintenance of receiver additions	n.a.	n.a.	n.a.	468
24.	Total	$ 2,692	$ 3,056	$ 3,637	$ 4,734

Note: n.a. = not applicable.

Served by One Satellite of 12 Video Channels							
Mexico				Colombia			
A Video Tape	B Micro-wave	C Rebroad-cast	D Direct Broadcast	A Video Tape	B Micro-wave	C Rebroad-cast	D Direct Broadcast
$ 8,646	$ 8,646	$ 8,646	$ n.a.	$ 9,273	$ 9,273	$ 9,273	$ n.a.
n.a.	n.a.	n.a.	2,680	n.a.	n.a.	n.a.	1,752
n.a.	3,149	n.a.	n.a.	n.a.	3,089	n.a.	n.a.
n.a.	n.a.	3,060	7,970	n.a.	n.a.	3,480	9,080
n.a.	n.a.	n.a.	6,130	n.a.	n.a.	n.a.	7,020
n.a.	n.a.	1,280	1,280	n.a.	n.a.	640	640
n.a.	n.a.	3,192	n.a.	n.a.	n.a.	2,660	n.a.
460	n.a.	n.a.	n.a.	384	n.a.	n.a.	n.a.
n.a.	436	436	436	n.a.	248	248	248
1,067	1,067	1,067	1,067	1,334	1,334	1,334	1,334
1,350	1,350	1,350	1,350	3,340	3,340	3,340	3,340
n.a.	n.a.	n.a.	7,620	n.a.	n.a.	n.a.	18,900
n.a.	n.a.	n.a.	4,708	n.a.	n.a.	n.a.	11,680
$11,523	$14,648	$19,031	$22,403	$14,331	$17,284	$20,975	$35,294
$ n.a.	$ n.a.	$ n.a.	$17,651	$ n.a.	$ n.a.	$ n.a.	$26,014
1,600	1,600	1,600	400	1,200	1,200	1,200	200
n.a.	417	n.a.	n.a.	n.a.	431	n.a.	n.a.
n.a.	n.a.	650	1,410	n.a.	n.a.	n.a.	n.a.
n.a.	n.a.	474	80	n.a.	n.a.	725	1,590
6	n.a.	n.a.	n.a.	n.a.	n.a.	356	40
41	6	6	6	4	n.a.	n.a.	n.a.
1,580	1,580	1,580	1,580	35	6	6	6
n.a.	n.a.	n.a.	336	2,236	2,236	2,236	2,236
				n.a.	n.a.	n.a.	830
$ 3,227	$ 3,603	$ 4,310	$ 3,812	$ 3,475	$ 3,873	$ 4,523	$ 4,902

								Served by One Satellite			
Venezuela				Total				Brazil			
A Video Tape	B Micro-wave	C Rebroad-cast	D Direct Broadcast	A Video Tape	B Micro-wave	C Rebroad-cast	D Direct Broadcast	A Video Tape	B Micro-wave	C Rebroad-cast	D Direct Broadcas
$6,894	$ 6,894	$ 6,894	$ n.a.	$32,847	$32,847	$32,847	$ n.a.	$12,382	$12,382	$12,382	$ n.a.
n.a.	n.a.	n.a.	1,339	n.a.	n.a.	n.a.	13,805	n.a.	n.a.	n.a.	4,430
n.a.	3,909	n.a.	n.a.	n.a.	12,816	n.a.	n.a.	n.a.	24,228	n.a.	n.a.
n.a.	n.a.	2,920	7,600	n.a.	n.a.	12,460	32,500	n.a.	n.a.	12,448	16,750
n.a.	n.a.	n.a.	5,900	n.a.	n.a.	n.a.	25,100	n.a.	n.a.	n.a.	n.a.
n.a.	n.a.	640	640	n.a.	n.a.	6,400	6,400	n.a.	n.a.	1,820	1,820
n.a.	n.a.	3,192	n.a.	n.a.	n.a.	9,044	n.a.	n.a.	n.a.	5,320	n.a.
385	n.a.	n.a.	n.a.	1,704	n.a.	n.a.	n.a.	574	n.a.	n.a.	n.a.
n.a.	208	208	208	n.a.	1,302	1,302	1,302	n.a.	260	260	260
534	534	534	534	3,735	3,735	3,735	3,735	1,067	1,067	1,067	1,067
1,910	1,910	1,910	1,910	8,490	8,490	8,490	8,490	3,150	3,150	3,150	3,150
n.a.	n.a.	n.a.	10,810	n.a.	n.a.	n.a.	48,020	n.a.	n.a.	n.a.	21,200
n.a.	n.a.	n.a.	6,685	n.a.	n.a.	n.a.	29,673	n.a.	n.a.	n.a.	11,000
$9,723	$13,455	$16,298	$23,041	$46,776	$59,190	$74,278	$114,252	$17,173	$41,087	$36,447	$48,677
$ n.a.	$ n.a.	$ n.a.	$17,216	$ n.a.	$ n.a.	$ n.a.	$ 89,369	$ n.a.	$ n.a.	$ n.a.	$38,477
1,400	1,400	1,400	200	5,400	5,400	5,400	2,000	2,600	2,600	2,600	600
n.a.	541	n.a.	n.a.	n.a.	1,789	n.a.	n.a.	n.a.	3,521	n.a.	n.a.
n.a.	n.a.	600	1,300	n.a.	n.a.	2,600	5,670	n.a.	n.a.	2,600	4,280
n.a.	n.a.	415	40	n.a.	n.a.	1,600	400	n.a.	n.a.	700	200
4	n.a.	n.a.	n.a.	21	n.a.	n.a.	n.a.	17	n.a.	n.a.	n.a.
35	6	6	6	146	18	18	18	76	6	6	6
1,513	1,513	1,513	1,513	6,779	6,779	6,779	6,779	2,904	2,904	2,900	2,904
n.a.	n.a.	n.a.	475	n.a.	n.a.	n.a.	2,100	n.a.	n.a.	n.a.	700
$ 2,948	$ 4,860	$ 3,934	$ 3,534	$12,346	$13,986	$16,397	$ 16,967	$ 5,597	$ 9,031	$ 8,806	$ 8,690

Table 20 (concluded)

Line	Cost Element	Argentina A Video Tape	 B Micro-wave	 C Rebroad-cast	 D Direct Broadcast
	Initial Costs:				
1.	Broadcast stations total	$ 9,059	$ 9,059	$ 9,059	$. n.a.
2.	Broadcast stations, main	n.a.	n.a.	n.a.	1,339
3.	Microwave	n.a.	16,309	n.a.	n.a.
4.	Satellite and launch I	n.a.	n.a.	3,134	4,218
5.	Satellite and launch II	n.a.	n.a.	n.a.	n.a.
6.	Ground stations, transmitting	n.a.	n.a.	640	640
7.	Ground stations, receiving	n.a.	n.a.	1,256	n.a.
8.	Tape library - total	579	n.a.	n.a.	n.a.
9.	Tape library - main	n.a.	206	206	206
10.	Studios and equipment	800	800	800	800
11.	Receivers	772	772	772	772
12.	Additions to receivers I	n.a.	n.a.	n.a.	7,726
13.	Additions to receivers II	n.a.	n.a.	n.a.	2,700
14.	Total I	$11,210	$26,146	$18,867	$15,701
15.	Total II	$ n.a.	$ n.a.	$ n.a.	$10,675
	Operating Costs:				
16.	Broadcast station	1,800	1,800	1,800	200
17.	Microwave	n.a.	2,369	n.a.	n.a.
18.	Satellite and launch	n.a.	n.a.	660	1,080
19.	Ground station	n.a.	n.a.	520	60
20.	Tape transport	9	n.a.	n.a.	n.a.
21.	Tape library	53	6	6	6
22.	Program production, teacher training, set maintenance	1,246	1,246	1,246	1,246
23.	Maintenance of receiver additions	n.a.	n.a.	n.a.	177
24.	Total	$ 3,108	$ 5,421	$ 4,232	$ 2,769

Note: n.a. = not applicable.

Served by One Satellite of 12 Video Channels

Bolivia				Chile				Peru		
A Video Tape	B Micro-wave	C Rebroad-cast	D Direct Broadcast	A Video Tape	B Micro-wave	C Rebroad-cast	D Direct Broadcast	A Video Tape	B Micro-wave	C Rebroad-cast
$3,651	$ 3,651	$ 3,651	$ n.a.	$6,445	$ 6,445	$ 6,445	$ n.a.	$ 7,949	$ 7,949	$7,949
n.a.	n.a.	n.a.	926	n.a.	n.a.	n.a.	1,339	n.a.	n.a.	n.a.
n.a.	6,619	n.a.	n.a.	n.a.	4,350	n.a.	n.a.	n.a.	16,270	n.a.
n.a.	n.a.	1,989	2,677	n.a.	n.a.	2,742	3,690	n.a.	n.a.	2,290
n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
n.a.	n.a.	640	640	n.a.	n.a.	640	640	n.a.	n.a.	640
n.a.	n.a.	2,660	n.a.	n.a.	n.a.	2,660	n.a.	n.a.	n.a.	3,724
247	n.a.	n.a.	n.a.	272	n.a.	n.a.	n.a.	418	n.a.	n.a.
n.a.	132	132	132	n.a.	180	180	180	n.a.	152	152
534	534	534	534	800	800	800	800	534	534	534
218	218	218	218	920	920	920	920	1,410	1,410	1,410
n.a.	n.a.	n.a.	2,184	n.a.	n.a.	n.a.	9,200	n.a.	n.a.	n.a.
n.a.	n.a.	n.a.	760	n.a.	n.a.	n.a.	3,202	n.a.	n.a.	n.a.
$4,650	$11,154	$ 9,824	$ 7,311	$8,437	$12,695	$14,387	$16,769	$10,311	$26,315	$16,699
$ n.a.	$ n.a.	$ n.a.	$ 5,887	$ n.a.	$ n.a.	$ n.a.	$10,771	$ n.a.	$ n.a.	$ n.a.
1,200	1,200	1,200	200	1,200	1,200	1,200	200	1,600	1,600	1,600
n.a.	965	n.a.	n.a.	n.a.	557	n.a.	n.a.	n.a.	2,417	n.a.
n.a.	n.a.	430	690	n.a.	n.a.	570	950	n.a.	n.a.	470
n.a.	n.a.	350	60	n.a.	n.a.	350	60	n.a.	n.a.	465
3	n.a.	n.a.	n.a.	7	n.a.	n.a.	n.a.	7	n.a.	n.a.
35	6	6	6	29	6	6	6	17	6	6
698	698	698	698	975	975	975	975	1,021	1,021	1,021
n.a.	n.a.	n.a.	50	n.a.	n.a.	n.a.	211	n.a.	n.a.	n.a.
$1,936	$ 2,869	$ 2,684	$ 1,704	$2,211	$ 2,738	$ 3,101	$ 2,402	$ 2,675	$ 5,044	$ 3,562

	Uruguay				Total			
D Direct Broadcast	A Video Tape	B Micro-wave	C Rebroad-cast	D Direct Broadcast	A Video Tape	B Micro-wave	C Rebroad-cast	D Direct Broadcast
$ n.a.	$1,852	$1,852	$ 1,852	$ n.a.	$28,956	$28,956	$28,956	$ n.a.
1,339	n.a.	n.a.	n.a.	926	n.a.	n.a.	n.a.	5,869
n.a.	n.a.	630	n.a.	n.a.	n.a.	44,178	n.a.	n.a.
3,082	n.a.	n.a.	2,290	3,082	n.a.	n.a.	12,445	16,719
n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
640	n.a.	n.a.	640	640	n.a.	n.a.	3,200	3,200
n.a.	n.a.	n.a.	532	n.a.	n.a.	n.a.	13,832	n.a.
n.a.	195	n.a.	n.a.	n.a.	1,711	n.a.	n.a.	n.a.
152	n.a.	151	151	151	n.a.	821	821	821
534	534	534	534	534	3,202	3,202	3,202	3,202
1,410	164	164	164	164	3,484	3,484	3,484	3,484
14,142	n.a.	n.a.	n.a.	1,644	n.a.	n.a.	n.a.	34,896
4,925	n.a.	n.a.	n.a.	573	n.a.	n.a.	n.a.	12,160
$21,299	$2,715	$3,331	$ 6,163	$ 7,141	$37,353	$80,641	$65,940	$68,221
$12,082	$ n.a.	$ n.a.	$ n.a.	$ 6,070	$ n.a.	$ n.a.	$ n.a.	$45,485
200	400	400	100	200	6,200	6,200	6,200	1,000
n.a.	n.a.	17	n.a.	n.a.	n.a.	6,325	n.a.	n.a.
780	n.a.	n.a.	470	780	n.a.	n.a.	2,600	4,280
60	n.a.	n.a.	116	60	n.a.	n.a.	1,800	300
n.a.	1	n.a.	n.a.	n.a.	27	n.a.	n.a.	n.a.
6	12	6	6	6	176	30	30	30
1,021	771	771	771	771	4,711	4,711	4,711	4,711
324	n.a.	n.a.	n.a.	38	n.a.	n.a.	n.a.	800
$ 2,391	$1,184	$1,194	$ 1,763	$ 1,855	$11,114	$17,266	$15,341	$11,121

are competitive with the video tape mode is in their common ability to reduce inventory of expensive video tape and the ability of the direct broadcast system to save the cost of all subsidiary television transmitters within a country.

Valuable information can be obtained from Table 20, simply by examining the cells marked "n.a." These "not applicable" costs can be used to differentiate among the alternative distribution modes, and they illustrate the trade-offs that can be made in selecting among them. Taking Peru as an illustration, the direct broadcast satellite system, Mode D, makes a saving of over $5.6 million in not having to build or expand broadcast stations outside of Lima. However, this saving, and that in reduced inventory of video tape at the subsidiary stations (about $250,000 saving), is more than offset by ground station costs and by Peru's share of the cost of a satellite launched to serve the five southernmost South American countries. On the other hand, Mode D is not as expensive in Peru as Mode B, the microwave network. The microwave system for Peru, even in 1980, would be largely new and quite expensive to build or expand.

Options I and II in the selection of the direct broadcast satellite for Mexico, Central America, Venezuela, and Colombia (lines 4 and 5) represent the programs' explorations for cost minimization. The direct broadcast satellite program found the cheapest receiver that would not exceed the flux density limit (a receiver having a 4 dB noise figure and 15-ft antenna diameter). It reported that two satellites can be lifted with an Atlas-Agena, although only one satellite needs to be lifted. If the receivers were to remain the same as for the other two regions and if the same flux density limit were to be observed, the booster would have unused capacity. For Central America and Mexico, advantage was taken of the additional 6 dB allowance in flux density and in booster lift capability to make the receiver cheaper. Of the 6 dB allowance of flux density resulting from antenna elevation, 2 dB were used. The figure of 2 dB corresponds to a 30° elevation of a receiving antenna. This minimum allowable elevation would probably apply to the northernmost station, Ciudad Juárez in Mexico. The use of this flux density allowed reduction in the noise figure that can apply to the receiver. In turn, the cost of additional receiver equipment dropped. To compensate for the cheaper receivers, the computer program designed a more powerful and a heavier satellite, but one that could still be launched with the same booster. The net trade-off was favorable, that is, the lowered cost of all receivers more than made up for the more expensive satellite.

Table 20 also includes a further attempt to optimize cost of receiver additions that has a significant effect on total cost, as indicated in lines 12 and 13, and 14 and 15. Option I represents the earlier computer run, in which it was assumed that electronic suppliers in several Latin American countries would want to participate in the procurement of the additions to television receivers that would be necessary for reception of signals from a direct broadcast satellite. It was assumed in Option I that there would be a single procurement for Brazil's equipment, and two procurements each for the other two regions. When it was noted how much receiver additions influence total cost, a run was made to determine what savings might result from all Latin American countries pooling their requirements into a single procurement of all 75,000 units. With this pooling of procurement, unit costs came down sharply from as high as $2,000 per receiver to $697.

The effects of the changes in receiver quality, satellite weight, and pooling of procurement can be seen by comparing Option I with Option II on lines 12 and 13.

Initial Costs, 1980 Demand

In comparisons among the four distribution systems studied, initial costs are shown, in Table 20, to be lowest for the simple and conventional mode of shipping video tapes by truck or air. The relative costs of the four modes depend on a variety of country factors, including population distribution, number of broadcast stations to be built or expanded, and other variables.

The rebroadcast satellite serves a function almost identical to that of microwave links. In those countries in which a considerable microwave net exists or will exist by 1980 (Chile, Uruguay, Central America, Colombia, and Venezuela), the microwave system is shown, not unexpectedly, to be more economical than the rebroadcast satellite system. Conversely, in those countries where little microwave net is projected to be completed by 1980 (Argentina, Bolivia, Peru and Brazil), the rebroadcast satellite system appears as most economical.

It is useful to consider which cost elements might represent claims on scarce foreign exchange. The computer programs for the rebroadcast satellite and direct broadcast satellite produced some detailed estimates of the differentiation between internal (domestic) costs and external (foreign exchange) costs. In general, the following approximate shares of each cost element might require external procurement. These estimates would vary considerably with the size of a country and its stage of technological development.

Initial Cost Element	Foreign Procurement Share (percent)
Broadcast stations	40-70%
Microwave networks	40-70
Satellite and launch	95-100
Ground stations	50-70
Video tape	0-100
Studios and equipment	30-60
Receivers and additions	30-100

Sensitivity of Results to Changes in Principal Variables

Many sensitivity analyses can be made from the information presented in Table 20. An example is the following analysis of initial costs for Central America, where it appears that the direct broadcast satellite mode is at a considerable disadvantage in comparison with the other modes. However, if it is assumed that only one source of educational programs could serve all of Central America, the cost differentials among delivery modes would be reduced. The estimate in Table 20 is based on the assumption that each of the six capital cities will have an ETV broadcasting station, thus permitting the transmission of some programming that is multinational (either Central American or Latin American in scope) and some that is produced and viewed within a single country. If ETV efforts could be pooled in a regional center serving all Central American countries as one system, the following initial cost savings would result:

Initial Cost Element	Initial Costs ($000) Six Centers	One Center	
Broadcast stations	$ 8,034	$1,339	
Ground stations	3,840	640	
Video tape	410	208	
Studios and equipment	800	534	
Total	$13,084	$2,721	
Savings			$10,363

This $10 million saving could allow the direct broadcast satellite system to show a cost approximately equal to that of the rebroadcast satellite system. Whether the advantages of potentially better programs through pooled efforts would offset the loss of local content would have to be weighed by Central Americans.

The demand estimates were based on the project team's judgment of the amount of ETV programming that could be organized and administered effectively in 1980, taking into account the educational development context and the views of ministry officials. The project team would have liked to have had time to make a second, higher estimate of 1980 demand, varying from the original estimate only by increasing the number of students reached and geographical area served. Time did not permit making this estimate for all countries; however, an analysis was made in one country, Colombia, that may shed light on what such a higher estimate would reveal for all of Latin America. The purpose of the analysis was confined to a comparison of only two delivery modes--video tape (A) versus direct broadcast satellite (D). The reason for neglecting Modes B and C was that they are certain to become increasingly expensive as service is provided to smaller concentrations of population not served by broadcast stations or microwave nets. However, the direct broadcast satellite should at some point become the least expensive system, since no local transmitter is required. This analysis was undertaken to determine at what point breakeven occurs, particularly in a country such as Colombia, where the population distribution, the expensive booster with unused capacity, and other factors resulted in the direct broadcast satellite system showing the highest cost.

In carrying out the "high" demand estimate for Colombia, first sets were installed in schools unequipped for television within the reach of transmitters of the six cities already served. The estimated demand for primary school ETV applications had saturated primary schools reachable from the six transmitters, but there were still some secondary schools to be served. This entailed adding 3,200 receivers to reach saturation in the secondary schools within reach of the six transmitters.

The next step was to add areas in Colombia in declining order of population and to locate the minimum number of television broadcast stations and translator stations (for relaying the signal to areas on the fringe of the transmitter signal) required to serve all cities and towns in Colombia of over 10,000 population, according to the latest census. This added 28 cities that could be reached by 10 additional broadcast stations and 11 translator stations. The population of these added areas, including the rural area adjacent to towns, amounted to 2,556,000 people, representing 123,000 added secondary students and 301,000 added primary school students. These students could be served by 6,510 receivers (including those receivers needed to saturate secondary schools near or in the original six main cities).

From this analysis, it was possible to recalculate the total initial cost for the two delivery modes--video tape and direct broadcast satellite. The results are as follows:

		Delivery Mode Costs ($000)	
Line Table 20	Initial Cost Element	A Video Tape	D Direct Broadcast Satellite
1	Broadcast stations	$22,778	$ 1,752
4	Satellite and launch (Colombia's share)	n.a.	7,020
6	Ground station	n.a.	640
8-9	Tape inventory	1,034	248
10	Studios and equipment	1,334	1,334
11	Receivers	4,645	4,645
12	Additions to receivers	n.a.	12,600
14	Total	$29,791	$28,239

In estimating the cost of additions to receivers, it was assumed that the total Latin American procurement under the "high" demand estimate would be approximately double the procurement allowed in the basic estimate. Therefore, economies of scale account for the lower unit cost of this cost element. Unit cost was reduced from $697 to $540.

It is probably safe to extrapolate the results obtained from the test exercise in Colombia to Latin America as a whole and conclude that the direct broadcast satellite would be the most economical system for equivalent traffic, when more nearly complete coverage is provided for a dispersed population. In Colombia, this point was reached when coverage was provided to more than about 35 to 40 percent of the country's population.

According to Table 20, the point was almost reached for Bolivia where, as was shown in Table 16, television transmitters reach only 24 percent of the population.

Operating Costs, 1980 Demand

Before analyzing differences in operating costs among the various delivery modes, it is necessary to discuss procedures used in estimating annual operating costs for distribution systems involving satellites. In estimating initial costs, the following equipment was included: two boosters per launch, and one satellite per launch. The second booster was provided in reserve against the possibility of launch failure of the first or of the subsequent launches. A satellite has a limited life; successive satellites must be launched at intervals if the communications service is to be provided continuously. The question then arises as to how to reflect such costs in the distinction between initial and operating costs. The procedure used in the estimate reported in Table 20 was to assign as operating costs a yearly prorated share of the launches that would occur every three years in the case of the direct broadcast satellite and every four years in the case of the rebroadcast satellite. The longer interval applies to the rebroadcast satellite, because this technology will have been in use longer than the direct broadcast technology and, hence, should be of a higher reliability.*

As was reported earlier in this section, it was found that for the rebroadcast satellite an economical launch procedure would be to launch all three satellites needed for the three Latin American regions on a single booster. On the average, every fourth year another launch would be required. This would be a procurement of one booster and three satellites, amounting to 30.1 million dollars. (The reserve booster had already been provided in the initial procurement). Each region's share of this amount every four years would be an annual cost of $2.5 million. To this should be added $100,000 per year for each region to represent the share of the cost of an estimated management fee for the space installation. Therefore, for the rebroadcast satellite, the sum of $2.6 million for each region needs to be allocated among the participating countries. This allocation was based on ETV hours transmitted, as were the allocations of initial costs.

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* The figures used correspond roughly to a combined launch-satellite reliability of .9 (rebroadcast) and .8 (direct broadcast).

For the direct broadcast satellite, the launch solutions described above used a two-satellite launch for the combination of Brazil and the southern group countries. The southern countries would require another booster and two satellites every three years, amounting to $25.1 million. An annual proration of this cost to each group would be $4.18 million. A separate single satellite launch was planned for the northern countries. The northern countries would require another launch of one booster and one satellite every three years, entailing an annual charge of $5.57 million. For each group, the charge of $100,000 for a prorated share of space management costs was added to the foregoing figures. Within the group of four northern countries, the regional cost was allocated, again, on the basis of ETV hours transmitted.

It is now possible to refer to Table 20 to analyze differences in operating costs among the four delivery systems. The cells in the table identified "n.a." can again be used as a means of differentiating among the four delivery modes to determine which cost elements are present or absent. For countries requiring substantial extensions to existing microwave networks, the expense of operating, maintaining, and depreciating the microwave system is usually high enough to more than offset the operating cost of the rebroadcast satellite.

In comparisons between the two types of satellite systems, the operating cost totals were, of course, influenced by the number of subsidiary transmitting stations planned for each country. Whenever the number of such stations within a country is relatively large, the direct broadcast satellite system shows lower operating costs than the rebroadcast satellite system.

A fairly large operating cost for the direct broadcast system would be that of maintaining the additions to the television receivers. This naturally would be a major item in countries that make extensive use of ETV, such as Colombia and the Central American countries.

Since expense of transporting video tape for Mode A is relatively low, this factor exerts no perceptible effect on the comparisons of alternative modes. An intangible cost factor operates here, however: the educational and logistical management problem associated with a large and valuable ($50 per hour for the one-inch tape) inventory of tapes. Each specific video taped program must be available at the right place at the right time. Mail and other delivery service in many Latin American countries is subject to delays and strikes. The accountability problem on valuable tape is difficult. Video tape recorders are expensive pieces of equipment that must be carefully maintained. If they are not scheduled and operated with precision, the programs that are to be copied and sent to subsidiary broadcasting stations may be delayed beyond the point in the curriculum where the material is needed in the classroom. The television stations in the United States that belong to NET have found the inventory and distribution of large numbers of video tape recordings to be a very complex matter.

One method of increasing the reliability of a system that depends on the delivery of video tape recordings would be to build redundancy into the system, perhaps by stocking reserve recordings at readily accessible points to meet emergency shortages. This emergency system might require its own transportation capability. Possibly a private airplane charter service would be necessary. To bring each of the four delivery modes to somewhat comparable reliability, some further operating costs should therefore be charged against Mode A, the video tape distribution system.

To test the effect of a substantially higher demand estimate on system costs, a sensitivity analysis was conducted for operating costs in Colombia, using the same "high" demand estimate employed in estimating initial cost. The result is shown in the tabulation on the following page. Here, the comparative advantage of the direct broadcast satellite system is established, since the added receiver maintenance is a much smaller increase than the maintenance cost of the additional transmitting stations required by the video tape distribution mode.

Line Table 20	Operating Costs	Operating Cost ($000's/yr) A Video Tape	Operating Cost ($000's/yr) D Direct Broadcast Satellite
16	Broadcast station	$3,200	$ 200
18	Satellite and launch (I)	n.a.	1,590
19	Ground station	n.a.	40
20	Tape transport	10	n.a.
21	Tape library	95	6
22	Program Production, Teacher Training, set maintenance	2,236	2,236
23	Maintenance of receiver additions	n.a.	1,160
24	Total	$5,541	$5,232

Initial and Operating Costs, 1972 Demand

Table 21 presents initial and operating costs of three alternative ETV distribution systems to meet the 1972 demand projections. Mode D, the direct broadcast satellite system, is omitted from this comparison, because it is not expected to be operational until 1975. Only five countries and Central America are included; the projected demand in the other Latin American countries, as measured by viewer hours per week, is expected to be small in 1972.

Since 14 channels are required for the estimated 1972 programming, it was assumed that one rebroadcast satellite could provide the service for distribution Mode C. This would be a satellite of 151 watts of power, lifted by a Thor Delta booster, with a satellite and launch cost of $17.6 million. These costs were allocated among countries according to hours transmitted.

Table 21

ETV DISTRIBUTION SYSTEM COSTS, 1972
(Thousands of Dollars)

Line	Cost	Central America			
		Video Tape	Micro-wave	Rebroad-cast	Video Tape
		A	B	C	A
	Initial costs:				
1	Broadcast stations	479	479	479	5,139
3	Microwave	n.a.	1,619	n.a.	n.a.
4	Satellite and launch	n.a.	n.a.	1,790	n.a.
6	Ground stations, transmitting	n.a.	n.a.	5,520	n.a.
7	Ground stations, receiving	n.a.	n.a.	n.a.	n.a.
8	Tape library total	168	n.a.	n.a.	134
9	Tape library main	n.a.	74	74	n.a.
10	Studios and equipment	800	800	800	1,067
11	Receivers	743	743	743	622
14	Total	2,190	3,715	9,406	6,962
	Operating costs:				
16	Broadcast stations	1,200	1,200	1,200	1,000
17	Microwave	n.a.	157	n.a.	n.a.
18	Satellite and launch	n.a.	n.a.	407	n.a.
19	Ground station	n.a.	n.a.	206	n.a.
20	Tape transport	4	n.a.	n.a.	2
21	Tape library	35	35	35	18
22	Program production, teacher training, set maintenance	834	834	834	1,110
24	Total	2,073	2,226	2,736	2,130

Note: n.a. = not applicable.

Line	Cost	Mexico		Colombia		
		Micro-wave	Rebroad-cast	Video Tape	Micro-wave	Rebroad-cast
		B	C	A	B	C
	Initial costs:					
1	Broadcast stations	5,139	5,139	6,542	6,542	6,542
3	Microwave	1,959	n.a.	n.a.	1,619	n.a.
4	Satellite and launch	n.a.	2,945	n.a.	n.a.	4,030
6	Ground stations, transmitting	n.a.	920	n.a.	n.a.	920
7	Ground stations, receiving	n.a.	3,596	n.a.	n.a.	4,370
8	Tape library total	n.a.	n.a.	173	n.a.	n.a.
9	Tape library main	110	110	n.a.	124	124
10	Studios and equipment	1,067	1,067	1,334	1,334	1,334
11	Receivers	622	622	376	376	376
14	Total	8,897	15,399	8,425	9,995	17,696
	Operating costs:					
16	Broadcast stations	1,000	1,000	1,200	1,200	1,200
17	Microwave	n.a.	n.a.	n.a.	179	n.a.
18	Satellite and launch	n.a.	665	n.a.	n.a.	915
19	Ground station	n.a.	220	n.a.	n.a.	260
20	Tape transport	n.a.	n.a.	3	n.a.	n.a.
21	Tape library	6	6	29	6	6
22	Program production, teacher training, set maintenance	1,110	1,110	1,145	1,145	1,145
24	Total	2,116	3,001	2,377	2,530	3,526

Note: n.a. = not applicable.

Table 21 (concluded)

Line	Cost	Venezuela Video Tape A	 Micro-wave B	 Rebroad-cast C
	Initial costs:			
1	Broadcast stations	2,874	2,874	2,874
3	Microwave	n.a.	1,080	n.a.
4	Satellite and launch	n.a.	n.a.	1,850
6	Ground stations, transmitting	n.a.	n.a.	920
7	Ground stations, receiving	n.a.	n.a.	1,748
8	Tape library total	103	n.a.	n.a.
9	Tape library main	n.a.	58	58
10	Studios and equipment	534	534	534
11	Receivers	413	413	413
14	Total	3,924	4,959	8,397
	Operating costs:			
16	Broadcast stations	600	600	600
17	Microwave	n.a.	107	n.a.
18	Satellite and launch	n.a.	n.a.	418
19	Ground station	n.a.	n.a.	130
20	Tape transport	2	n.a.	n.a.
21	Tape library	18	6	6
22	Program production, teacher training, set maintenance	724	724	724
24	Total	1,344	1,437	1,878

Note: n.a. = not applicable.

		Brazil			Peru		
Line	Cost	Video Tape A	Micro-wave B	Rebroad-cast C	Video Tape A	Micro-wave B	Rebroad-cast C
	Initial costs:						
1	Broadcast stations	4,000	4,000	4,000	545	545	545
3	Microwave	n.a.	16,700	n.a.	n.a.	10,919	n.a.
4	Satellite and launch	n.a.	n.a.	3,460	n.a.	n.a.	495
6	Ground stations, transmitting	n.a.	n.a.	2,760	n.a.	n.a.	920
7	Ground stations, receiving	n.a.	n.a.	3,596	n.a.	n.a.	1,748
8	Tape library total	151	n.a.	n.a.	49	n.a.	n.a.
9	Tape library main	n.a.	101	101	n.a.	25	25
10	Studios and equipment	1,067	1,067	1,067	267	267	267
11	Receivers	215	215	215	34	34	34
14	Total	5,433	22,083	15,199	895	11,790	4,034
	Operating costs:						
16	Broadcast stations	1,200	1,200	1,200	600	600	600
17	Microwave	n.a.	314	n.a.	n.a.	839	n.a.
18	Satellite and launch	n.a.	n.a.	783	n.a.	n.a.	112
19	Ground station	n.a.	n.a.	300	n.a.	n.a.	130
20	Tape transport	7	n.a.	n.a.	2	n.a.	n.a.
21	Tape library	42	12	12	18	6	6
22	Program production, teacher training, set maintenance	928	928	928	203	203	203
24	Total	2,177	2,454	3,223	823	1,648	1,051

Note: n.a. = not applicable.

The results in Table 21 show that the video tape distribution system is the least costly of the three in both initial and operating costs. In comparing the microwave mode with that of the rebroadcast satellite, the microwave system is less costly in all countries except Brazil and Peru, where little microwave net is expected to be in existence in 1972, according to telecommunications plans of the various countries.

Cost-Effectiveness of Alternative Delivery Systems

The measure of ETV traffic developed earlier in this report--viewer hours per week--can also represent a measure of effectiveness of the alternative systems. Of course, at some time it would be desirable to introduce some qualitative dimension in the measure of effectiveness, and perhaps some sort of weighting to reflect priorities for educational development. However, the simple measure of viewer hours per week is of use in comparing alternatives and determining a way in which effectiveness may be related to coverage. It is possible to combine this effectiveness measure with the costs developed for alternative delivery modes.

An illustrative calculation of cost-effectiveness for Modes A and D in 1980 and 1972 is presented in Table 22. Columns 4 and 5 show initial cost per viewer hour, and columns 6 and 7 show operating cost per viewer hour. As expected, the countries with the most massive use of media show the lowest costs per viewer hour, with Colombia's 1980 video tape system costing only 23 cents per viewer hour for initial cost and only 5 cents per viewer hour in annual operating cost. The high costs per viewer hour applying in Bolivia and Uruguay reflect the relatively small number of

Table 22

COST-EFFECTIVENESS OF VIDEO TAPE AND DIRECT BROADCAST SATELLITE SYSTEMS, 1972 and 1980

	Initial Cost ($000's)			Initial Cost per Viewer Hour		Operating Cost per Viewer Hour	
Country	A Video Tape	D Direct Broadcast	Viewer Hours (000's)	A Video Tape	D Direct Broadcast	A Video Tape	D Direct Broadcast
Demand Estimate, 1980							
Central America	$11,199	$28,488	16,900	$0.66	$1.69	$0.16	$0.28
Mexico	11,523	17,651	9,713	1.19	1.82	0.34	0.39
Colombia	14,331	26,014	63,707	0.23	0.41	0.05	0.07
Venezuela	9,723	17,216	18,401	0.54	0.93	0.16	0.19
Brazil	17,173	38,477	36,093	0.48	1.07	0.17	0.24
Argentina	11,210	10,675	6,509	1.72	1.64	0.48	0.44
Bolivia	4,650	5,887	1,658	2.81	3.56	1.17	1.03
Chile	8,437	10,771	8,065	1.04	1.33	0.27	0.30
Peru	10,311	12,082	14,299	0.72	0.85	0.19	0.17
Uruguay	2,745	6,070	1,999	1.38	3.04	0.59	0.93
High Demand Estimate, 1980							
Colombia	29,791	28,239	79,847	0.37	0.35	0.07	0.07
Demand Estimate, 1972							
Colombia	8,425	17,696	7,290	116	2.44	0.33	0.49

viewers that were estimated. The population concentration in Montevideo would justify a much larger estimate of viewers there, but the dispersion of population in Bolivia will make it difficult to achieve a high viewer figure in that country.

Table 22 also includes figures from the analysis of a "high" demand figure for Colombia. Very interesting results are obtained by comparing the costs for the two 1980 demand levels estimated for Colombia. Between the two levels several transitions occurred: (1) the direct broadcasting distribution system (Mode D), became, for the first time in Colombia, cheaper than shipping video tape recordings; (2) the video tape method began to suffer diseconomies of scale from standpoints of both initial and operating cost, in that cost per viewer hour turned upward as the system was expanded to reach more dispersed listeners via conventional stations; and (3) unit costs of the direct broadcast satellite system, (Mode D), continued to decline, even in the face of population sparsity. This analysis provides empirical data on what could be theoretically deduced: that among distribution systems for mass media, the direct broadcast satellite exhibits the best growth characteristics, after a certain breakeven coverage is reached.

Cautionary Remarks Concerning System Costs

In Table 20 it will be noted that the initial and operating costs of direct broadcast satellite and launch (lines 4, 5, and 18) are substantially higher for the northern group of countries than for either of the two southern groups. This difference was a result of the launch strategy described above, in which the two southern regions' satellites shared a single booster, whereas the satellite for the northern group required a separate booster. Even with the trade-offs between receiving station quality and satellite power described above (Option II), it was not possible to bring the northern group's satellite and launch cost below $25.1 million.

Actually, selection of which satellite of the three being launched should be assigned to which region is quite arbitrary. They were assigned as discussed in the foregoing paragraph in part because of the equatorial location of the northern group, which permits somewhat higher flux densities. Another consideration was that the more expensive satellite and launch should probably be counted against the group of countries where the most traffic had been projected--in other words,where there would be the greatest ability to pay.

Perhaps a more defensible strategy would have been to pool the costs of all three regions' satellites, raising the costs for Mode D in Brazil and in the southern countries and lowering the Mode D costs in the northern countries. Still another defensible assignment could have been that of the northern countries sharing the dual satellite launch. If this procedure had been used, the direct broadcast mode would appear more attractive for the northern countries and less so for whichever of the other two regions had to bear the full cost of the single satellite launch.

Summary of System Comparisons

Table 23 presents initial and operating costs for two methods of meeting the projected 1980 ETV demand, summed for all the countries studied in Latin America. To simplify the table, only the direct broadcast satellite

Table 23

COSTS OF TWO ETV DISTRIBUTION SYSTEMS TO MEET 1980 DEMAND: LATIN AMERICAN TOTALS AND PERCENT DISTRIBUTION BY COST ELEMENT

	Video Tape System		Direct Broadcast Satellite System	
	$000	%	$000	%
Initial Costs				
Broadcast stations	$ 74,185	73.2%	$ 24,104	14.1%
Satellite and launch	n.a.	n.a.	58,600	33.9
Ground stations	n.a.	n.a.	11,420	6.6
Tape library	3,989	3.8	2,383	1.4
Studios and equipment	8,004	7.5	8,004	4.7
Receivers	15,124	14.2	15,124	8.8
Additions to receivers	n.a.	n.a.	52,833	30.5
Total	$101,302	100.0%	$172,468	100.0%
Operating Costs				
Broadcast stations	$ 14,200	48.9%	$ 3,600	9.8%
Satellite and launch	n.a.	n.a.	14,230	38.7
Ground stations	n.a.	n.a.	900	2.4
Tape transport	65	0.2	n.a.	n.a.
Tape library	398	1.4	54	0.1
Program production, teacher training, and set maintenance	14,394	49.5	14,394	39.2
Maintenance of receiver additions	n.a.	n.a.	3,600	9.8
Total	$ 29,057	100.0%	$ 36,778	100.0%

Note: n.a. = not applicable.

and video tape systems are compared. Examination of the dollar cost columns shows that the satellite system makes initial and operating cost savings in broadcast stations, but that these are more than offset by costs of satellite and launch and of the television set augmentations required to receive the signal directly from the satellite. The cost of set augmentations is highly sensitive to quantity procured. If substantially more than the 75,000 sets on which this calculation was based were to be procured, this initial cost element would be considerably reduced.

The percentage distribution column in the table is informative on how funds would have to be spent for either distribution system. In the video tape system, the bulk of initial expenditures is on broadcast stations and studios and their equipment, whereas in the direct broadcast satellite system, the largest items are for the satellite and launch and for procuring set augmentations. With respect to operating costs, program production, teacher training, and set maintenance are important for both distribution systems, but for the satellite system, operating funds must be put aside for successive launches every three to five years to maintain the communications capability.

In Table 24, the qualitative as well as quantitative criteria for comparing the alternative ETV distribution systems are organized and classified. A relative rating of excellent, good, fair, or poor is assigned the degree to which each of the four distribution systems achieves each criterion noted. The relative performance of each system in relation to most of the criteria has been discussed elsewhere in the report. In the following, only those considerations not previously considered will be mentioned.

Table 24

RELATIVE PERFORMANCE OF ALTERNATIVE DISTRIBUTION SYSTEMS

	ETV Distribution System			
Criterion	Video Tape	Microwave	Rebroadcast Satellite	Direct Broadcast Satellite
Educational				
Ability to pace and control modernization	Poor	Good	Good	Excellent
Ability to reflect local programming needs	Excellent	Fair	Poor	Poor
Psychological impetus for modernization	Fair	Fair	Good	Excellent
Encouragement for multinational integration	Poor	Fair	Good	Excellent
Potential for growth in geographical coverage	Fair	Poor	Fair	Excellent
Simultaneous reception of important events	None	Good	Good	Excellent
Management				
Simplicity of local management	Poor	Fair	Fair	Good
Simplicity of central management	Good	Excellent	Fair	Fair
Adaptability to pilot tests of software	Excellent	Fair	Poor	Poor
Indirect Effects				
Spillover benefits for local communications	Good	Excellent	Good	Poor
Opportunity to develop local industries	Excellent	Good	Fair	Fair
Reliability				
Freedom from overall system interruption	Excellent	Good	Fair	Poor
Freedom from local failures	Poor	Fair	Fair	Good
Fiscal				
Cost of covering major urban centers	Excellent	Good	Fair	Poor
Cost of covering entire country	Fair	Poor	Poor	Good
Potential for major foreign assistance	Poor	Fair	Good	Good

Under management criteria, "adaptability to pilot tests" refers to whether or not the system lends itself to operational experimentation on a small scale without incurring large expenses. Only the video tape system can be rated excellent on this score.

In considering indirect effects, the ground-based systems offer greater spillover benefits in contributing to the growth of a communications infrastructure. The direct broadcast satellite is rated poor, because only the large and expensive transmitting ground station could be a source of broadcasting. In the other systems, local transmitters would have to be established. They would have alternative uses for news and cultural programming. In the development of local industries, the satellite systems would probably continue to require foreign procurement of space-related equipment, while the ground-based systems could lead to the development of a national, or at least a regional, electronics industry.

Satellite communications reliability is discussed at length in Working Paper No. 4, by B. R. Stack, in Volume IV of this report series. In summary, satellite systems are vulnerable to various kinds of interruption. A failure can result in the entire system being inoperable, which might pose severe readjustment strains on an educational system in which ETV had been integrated into curriculum. The direct broadcast satellite would be the most vulnerable to system failure, because no local television transmitters would be available for emergency programming of live or taped lessons. Local failures or interruptions, on the other hand, can come from nonreceipt of video tapes or from poor logistical management. On this criterion, the satellite systems, being more centralized and simpler to manage in the field, show a rating superior to the ground-based systems.

Cost comparisons have been covered at length in this report, but an additional comment should be made on the criterion of "potential for major foreign assistance." With the predisposition of multilateral and bilateral donors to favor large scale technologically-based assistance programs, it would appear that the satellite distribution systems might have somewhat better prospects of attracting assistance grants or loans than would the more modest distribution systems.

VII IMPLEMENTATION

At this early stage of exploring the use of space technology in economic and social development, it is difficult to see in what ways Latin Americans may avail themselves of this new potential. It may be useful to examine a plausible sequence of events inherent in the adoption of a satellite system for ETV in Latin America. Even though such an effort has to be largely conjectural, it may offer a few insights for decisions on investments and organization and the times at which such decisions must be made. If such choices can be recognized early, the full potential benefits of the technology can be realized.

Certain preconditions must prevail, if this sort of speculation is to be at all worthwhile. Many of these preconditions have been implicit in the discussions in preceding sections.

- There must be a widespread commitment to Pan-American cooperation in education and training. Since education and training institutions serve society, there must also be cooperation among the economic, political, and cultural institutions of the several countries. (Probably only Brazil is of sufficient size in population and area to consider unilateral use of communications satellite technology.)
- The commitment to educational modernization and reform that is present in several Latin American countries today must be broadly diffused. ETV is at its best when used as an instrument for

innovation of improved instructional content and method. There is little justification for putting scarce money and manpower resources into ETV, unless major reform is a goal. A subsidiary commitment, then, must also be to engage the efforts of people who can creatively deal with all the software aspects of ETV--program production, distribution, utilization, and feedback.

- Latin American countries must demonstrate a commitment to strengthening teacher training. This is because, second only to the student, the classroom teacher is the most important component in any instructional system. It is the project team's considered view that until a majority of classroom teachers have internalized the advantages of television-aided learning, the benefits of an ETV system cannot be realized.

Assuming the foregoing preconditions evolve in Latin America, there is reason to believe that ETV applications will reach the activity levels at which satellite-distributed systems will become economically competitive with terrestrial distribution.

The following scenario outlines stages of development leading to the adoption of a satellite-based system, together with some of the events that would need to be planned and implemented. Much revision and refinement would, of course, be necessary for an actual plan. The scenario is intended only as a basis for discussion. It assumes that the United States completes the development of an operational direct broadcast satellite system by 1975.

Stage One (1968-1972)

- Planning for ETV is begun in Latin American countries not yet using broadcast media, and extensions are made of existing applications in the eight countries already using some educational broadcasting. This effort will be greatly facilitated by inter-Latin American visits of educators and media personnel to sites of ETV applications already in leadership positions, such as primary education in Colombia and Venezuela, secondary education in El Salvador, higher education in Mexico, and accelerated secondary education in Brazil.

- The OAS establishes its planned multinational training center for ETV. Member countries accelerate training of electronic technicians, educational program production experts, utilization personnel, and other specialized manpower by training them in domestic institutions, at the OAS Center. or outside Latin America at ETV centers in Europe, Japan, or the United States.

- The United States offers to make an experimental satellite available to Latin American countries under arrangements similar to those applying to the agreement with India, in which an ATS (Advanced Technology Satellite), after certain NASA experiments have been completed, will be moved to a parking space over the Indian Ocean for India's use in education and development.

- Certain Latin American countries, probably working through machinery of the OAS, organize to accept the experimental satellite and to plan for its pilot use. This will require development and harmonizing of national ETV planning, with participation of ministries of education, communications agencies, and large scale users of educational broadcast media, including private organizations that offer fundamental education or industrial training.

- Latin American nations petition for sufficient frequency allocation and satellite parking spaces for their projected educational needs at an international space conference. This will assure that other users do not usurp limited world resources.

Stage Two (1972-1975)

- Educational and training administrations refine and modernize administrative and logistical practices to assure high reliability of all the parts of the ETV instructional system--set maintenance, program scheduling, availability of teacher and student guides, and so forth.

- The terrestrial telecommunications net is expanded to link many of the major urban centers. Some educational programming for simultaneous national reception will be transmitted over this network. This will provide valuable experience in operating a large scale ETV system.

- The experimental satellite is made available to the Latin American countries. Pilot use begins, with emphasis on programs of common interest to the several member countries. Some of this programming will be devoted to applications of primary value to rural populations, to provide experience that will be useful when the direct broadcast satellite becomes operational.

- Latin Americans agree on joint procurement of the augmentations to receivers that will be used in connection with the direct broadcast satellite system, since minimal unit cost of this equipment is of critical importance in the feasibility of this distribution system.
- Appropriately constituted regional or OAS agencies negotiate with the United States for the launch, in 1975, of direct broadcast satellites. The specifications for these satellites will be tailored to the educational needs determined by the Latin American commission or commissions.

Stage Three (1975 and Beyond)

- The direct broadcast satellites needed for education in Latin America are put in orbit. The Latin American countries will share these facilities according to the criteria that they have established. Such criteria are likely to consider high viewer hour demand, difficulty of providing education and training by other means (for example,in remote areas isolated by difficult terrain), criticality of content (for example, continuing education for practicing medical doctors), contribution to Latin American integration, and so forth.
- The availability of the direct broadcast satellite, and the organizational arrangements that have preceded it, encourage other innovations useful in bringing about educational advance in

Latin America. Among these might be computer-aided instruction, two-way communications between classroom and studio teachers, development of individualized systems by which a student or teacher at a terminal can interact with a source of audio-visual information.

VIII CONCLUSIONS

Potential for Satellite Distribution of ETV

1. In certain applications--for example, primary education in Colombia, telesecundaria in Mexico, kindergarten and primary education in Venezuela, and accelerated secondary education in Brazil--ETV is already being used effectively in Latin America.

2. ETV offers significant potential for accelerating the achievement of at least 12 of the 16 high priority objectives for human resources development that were stated by various Latin American education and development planning officials during the project team's field study. ETV applications that have high growth potential, measured in terms of viewer hours per week, include primary education; secondary education; fundamental education for adults in urban favelas, barriadas, and barrios; and accelerated primary or secondary education for school dropouts. ETV applications that have smaller viewer-hour potential but offer important leverage in development include inservice and preservice teacher training, technical occupational training, science and mathematics instruction at secondary and university levels, and continuing professional training for practicing medical and engineering graduates.

3. The demand for each of 12 ETV applications has been estimated for nine countries and Central America for 1968, 1972, and 1980. If the number of viewer hours per week of organized reception (in a classroom or telecenter) is converted to an index of 100 for 1968, the index for

the 1972 estimate is 212 and the index for the 1980 estimate is 1410, a 14-fold increase.

4. When a satellite distribution system is used, distant points can be linked as easily as adjacent points. Efficient use of this technology, then, can occur only if there is to be extensive intercountry exchange of educational programming. At present, only in Central America is there the beginning of effective multinational cooperation in solving educational development problems. Despite little existing evidence pointing toward the growth of multilateral collaboration in education, the estimates prepared for this study assume that by 1980 about 25 percent of ETV hours transmitted from any main center (generally a country capital) will be imported programs that are produced under some sort of joint auspices in another Latin American country. Some of this common programming might be received simultaneously in several countries; however, it is assumed that for the bulk of ETV programming there would be simultaneous reception only within a single country to permit national coordination of viewing times with school calendars, time zones, and local holidays. Nonsimultaneous reception, even within a single country, is characteristic of the video tape distribution mode.

5. For the countries studied, 14 ETV channels will be needed in 1972 and 30 in 1980 to accommodate the number of hours transmitted per week and the variety of subjects and levels to be covered.

6. In the space age, four principal methods of distributing ETV are available: shipment of video tapes by truck or aircraft, microwave transmission, linking of television transmitters by rebroadcast satellite,

and linking of television transmitter to receivers in classrooms or other viewing centers by direct broadcast satellite. The computer-based model developed in this study can be applied to generate hardware and software cost elements for each of the four basic ETV distribution methods.

7. Technical considerations dictate that three satellites will be required to meet the 1980 requirements for ETV channels in Latin America. An economical launch procedure for the rebroadcast satellite could use a booster such as the Atlas-Agena to lift all three satellites. Central America, Mexico, Colombia, and Venezuela could share one satellite; Brazil could use another; and Argentina, Bolivia, Chile, Peru, and Uruguay the third satellite.

8. An economical launch procedure for the three direct broadcast satellites is to lift the two satellites (which would be heavier than the rebroadcast satellites) for the southern groups of countries, also with a booster such as the Atlas-Agena. An identical satellite for the northern countries would require another booster of the Atlas-Agena thrust.

9. Cost comparisons of four ETV distribution methods (shown in Table 20, Section VI) indicate that, of the four alternatives, that of shipment of video tape by truck or air appears to have the lowest initial and operating costs for the 1980 demand estimate. A second and higher demand estimate was projected for Colombia, in which all towns of over 10,000 population would receive ETV either by video tape or direct broadcast satellite. Based on this demand, both initial and operating costs of the direct broadcast satellite mode are shown to be slightly lower than those for video tape distribution. This analysis, together with the

range of results available from analysis of the basic demand estimates for other Latin American countries in 1972 and 1980, suggests the following generalizations about cost-effectiveness of the four alternative distribution modes:

- Video tape distribution is the least-cost mode up to a high degree of ETV saturation of urban schools.
- If full geographical coverage is sought, the direct broadcast satellite system becomes the least cost mode for the population residing beyond the range of transmitters located in principal cities.
- If ETV is to be extended to student populations in ascending order of cost per student, the break-even point at which the direct broadcast satellite begins to be more cost-effective than video tape distribution lies between 35 and 60 percent of total country population, the particular point being dependent on population distribution and the presence or absence of television transmitters in outlying areas. Of the four distribution modes, only the direct broadcast satellite system exhibits declining unit cost per student served with increasing coverage. The other modes exhibit rising unit costs after the 35 to 60 percent of country population residing in medium and large cities has been served.

10. The microwave transmission and rebroadcast satellite modes provide fairly interchangeable service. Taking into account the expected development of microwave networks in most Latin American countries, the

rebroadcast satellite system is generally more expensive than microwave transmission. There are exceptions to this in Peru, Bolivia, and Brazil, where the cost of entirely new microwave links is sufficiently high that the rebroadcast satellite system shows lower costs. It would appear to be difficult to obtain full regional collaboration on a rebroadcast satellite for ETV in Latin America, because several of the countries can obtain the same service more economically with microwave transmission. Further, the growth characteristics of the rebroadcast satellite system are not as favorable as those of the direct broadcast satellite system.

11. The satellite-based distribution modes may offer advantages over terrestrial systems that are difficult to quantify in cost-effectiveness terms, such as the following:

- Video tape distribution presents a more complex administrative and logistical burden than would simultaneous countrywide reception transmitted from the capital city by any of the alternative distribution systems. Assuring reliable and timely delivery of the many video tapes to subsidiary transmitting stations would be difficult, as would the inventory management of this amount of valuable programming. Central transmission for simultaneous reception within a country can assure pacing of curriculum and maintenance of standards of educational offerings throughout the country's educational system. If modernization and reform of content and instructional methods are important objectives, as they seem to be in many Latin American countries, the centralized transmission systems would appear to offer more control and simplicity of administration than the video tape distribution system.

- A satellite distribution system, perhaps even the prospect of its implementation, may offer critical psychological impetus to educational progress, both nationally and regionally. The dramatic technology of satellite systems may capture the imagination of large numbers of Latin Americans. ETV has already proved itself most effective as an instrument of educational change, bringing the possibility of modern curriculum content and instructional method to a much wider number of students than is possible with traditional educational systems. Satellite-distributed ETV could shorten the time required to offer modern and effective instruction to an entire country or region. Since its use requires some pooling of efforts for system hardware, joint approaches to system software could also be expected. These cooperative efforts should accelerate regional integration in finding and implementing solutions to educational development objectives.

Policy Implications

One of the purposes of the Latin American case study was to assist USAID and the President's Task Force on Communications Policy in identifying the initial steps and policies that could facilitate the use of satellite potential for education in developing countries. Certain policy implications emerge from the analysis.

1. Existing U.S. policy to support regional integration and cooperation in education is of great importance if the potential of ETV, whether terrestrial or satellite, is to be realized. Specific programs for helping to implement that policy include:

- Intercountry harmonizing of curricula and textbooks
- Implementation of the planned OAS training center in ETV
- Financial support for inter-Latin American exchanges of educators and broadcast media personnel

2. Existing U.S. policy to support requests for assistance in educational television is also of importance. The pilot program being developed by the government of El Salvador, with assistance from the United States, has great promise. It should take its place with Colombia's primary education program in demonstrating to other Latin American countries the potential for educational advances inherent in the large scale use of the television medium.

3. High priority should be accorded requests from Latin Americans for assistance in training and retraining of teachers to become effective in an instructional system of which ETV is an integral part. The teacher training technique of microteaching appears to be effective in meeting the dual objectives of modernizing pedagogy and orienting teachers to the video technology.

4. High priority should also be accorded requests from Latin Americans for assistance in strengthening educational planning and administration. ETV technology, whether satellite or terrestrially delivered, requires a correspondingly advanced social technology for its effective management.

5. Financial and technical assistance should be available for planning and organizing the software aspects of satellite distribution systems. The demand estimates included in this report were prepared by the

project team with entirely insufficient information, because Latin Americans had made virtually no projections. The planning step of most immediate importance is that of looking more critically at educational applications of broadcast media, not that of repeating hardware studies that make gross and unwarranted assumptions about educational applications. Demand for ETV applications should be assessed carefully by Latin Americans in terms of educational content, viewer hours per week, and schedule feasibility.

6. For purposes of educational applications, the direct broadcast satellite system, not the rebroadcast satellite system, offers interesting growth potential for large scale coverage. The critical influence on system costs represented by the augmentations to the direct receiver suggests the desirability of a policy of supporting research and development that would minimize unit costs for this equipment, particularly for procurement of quantities of between 10,000 and 200,000.

7. The projected need for three 12-channel satellites required to serve 1980 educational needs of Latin America brings into focus a possible problem of saturating the inter-American "parking slots" in the equatorial orbit. The direct broadcast satellite is a particularly heavy consumer of parking space.

The three satellites projected for Latin America would be in addition to:

- The INTELSAT requirements for the Atlantic services
- The domestic satellite needs of the United States (probably four satellites)

- The domestic satellite needs of Canada (probably three satellites)

To avoid a possible conflict of interests and difficulty for Comsat as a possible future manager of INTELSAT, it would be desirable to secure additional space frequencies. Parking slots and frequency spectra represent world resources that must be conserved and allocated wisely.

8. Policy should be directed toward capturing whatever psychological impetus is present in the concept of using satellite-distributed ETV. One method of doing this is to arrange for a satellite to be available on an experimental basis, as is being done in the cooperation between the United States and India. If this is arranged, after certain NASA experiments have been completed, an ATS series satellite will be moved to a parking slot over the Indian Ocean for experimental use in education. If it is possible to obtain another satellite from NASA, under similar arrangements, particularly if a satellite having rudimentary direct broadcast capability is available, it might be beneficial to offer Latin American countries this same opportunity. The terms of the offer should include provision for multinational cooperation and for Latin American countries to plan and manage the program.

Appendix A

HOW EFFECTIVE IS TELEVISION?

by Wilbur Schramm

This appendix deals with the evidence concerning the effectiveness of television in a national program of education and development.

There have been upwards of 500 research papers on ITV (instructional television), and several hundred papers on instructional films that are done in such a way as to make their results largely applicable to television. In addition, there are about 30 case studies of major television projects. Most of these studies have been conducted in the industrialized countries--the majority of them in the United States--but about 10 percent of the research comes from the developing countries of Asia, Latin America, Africa, and the South Pacific.*

Do viewers learn from television?

There have been hundreds of experiments on learning from television--at the elementary, secondary, and college levels, at home and in school, in city and village, in childhood, adolescence, and adulthood, with gifted children and handicapped children, and with almost every kind of subject matter that people want to teach or learn. These studies are summed up in the Chu and Schramm volume, and in many other places, and there is no need to go through them in detail here. The conclusion is, overwhelmingly, that viewers learn a great deal from television. They learn from systematic teaching, and they learn incidentally from television things it is not planned to teach (for example, a study of two Canadian communities found that children in the community with television came to the first grade, at age 6, with vocabularies that averaged a year higher than children in the community without television). They learn facts, concepts, skills, values and customs--needless to say, not all of which may be socially desirable. But the evidence is so conclusive that there can no longer be any reasonable doubt of television's ability to be an effective instrument of information and instruction.

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* The most nearly complete summary of the research on television as an instrument of education and development is Chu and Schramm, Learning from Television (Stanford, 1967). This volume also lists most of the existing bibliographies and summaries of research in the field. The largest collection of case studies is the three volumes entitled The New Media in Action: Case Studies for Planners (Paris: UNESCO and I.I.E.P., 1967).

Here are a few examples from the literature. The first large experiment with ITV in the United States, in Washington County, Maryland, found spectacular gains in the performance of many television classes, when measured against nationally standardized tests. For example, in junior high mathematics, the average achievement level of urban pupils rose in four years of television from the 31st to the 84th percentile, on national norms for tests of mathematical concepts. In grade 10 mathematics, urban schools rose from the 34th to the 51st percentile on national norms. Before television, schools outside Hagerstown were below the national norm for achievement on arithmetic in the third, fourth, fifth, and sixth grades. After one year of television, two of the four grades were above the national norm; after two years of television, all four grades were above the norm. Before television, students outside the city had averaged one-quarter to one-half a grade below the city students on standardized arithmetic tests; after three years of television, their achievement was comparable to that of students in the urban schools. This ability of television to equalize learning opportunities is obviously of the greatest importance.

Not all the results in the literature are as spectacular as these, but they indicate beyond a shadow of doubt that a great deal of learning takes place, in a great variety of situations and uses. In Chicago, an entire junior college curriculum has for ten years been offered on the air. Where there have been differences in the performance of students who took these courses at home and students who studied in the classroom, the advantage has been with the home television students (UNESCO cases, Volume II). In Japan, an entire secondary school curriculum is offered by television and correspondence study, with highly favorable results (UNESCO cases, Volume 1). Since 1960, Italy has used television (the widely admired series of programs entitled "Non é mai troppo tardi"--It's Never Too Late) to help teach upwards of 100 000 illiterates to read and write (summary in UNESCO cases, Volume III). When the United States tried teaching certain basic military skills by television, television students were significantly superior to conventionally taught students in five of 17 tests, and there was no difference in the other 12. United States Navy Midshipmen receiving instruction in basic electronics from television were found to score higher than Midshipmen taught by conventional methods. In the United States and more than a dozen other countries, television has been found to be a very effective tool of teacher training. Crile, in Audiovisual Communication Review, 1957, reports generally favorable results with agricultural television. There are at least 24 studies reporting effective teaching of health subjects by television (see the Chu-Schramm study). A postgraduate program in medicine has been taught successfully on open-circuit television. Deaf students have been trained efficiently by television to a criterion of typewriting performance. The range of subjects taught successfully by television at all levels of school from first grade through college has included natural science, social science, mathematics, philosophy, literature, reading, foreign language, and art. IBM has used television with considerable success for customer engineer training. And the medium has even been used effectively to orient preschool children to the experience they would have in the first grade.

Thus, there is little reason to doubt that television, where it is needed, can be used effectively to carry any part of the teaching-learning process that a one-way, sight-and-sound medium can carry. It can't very efficiently conduct a discussion or run a seminar or answer questions that occur during the lesson. Obviously, it can be used in some situations and some ways more effectively than in others. Therefore, let us set aside any doubt that it can be used effectively as an instrument of instruction and information, and inquire instead where and how it can be used most effectively.

When do viewers learn more from television?

This is a much more difficult question than the previous one, especially in the form it is usually asked: Do pupils learn more from televised or from face-to-face teaching? This is because it is extremely difficult to design media-comparison studies that are both scientifically rigorous and realistic. In the comparatively few cases where this rigor has been achieved (see Chapter I of Chu-Schramm study), the results have inevitably shown no significant differences. But we could hardly expect otherwise when the conditions for such a design are met: when exactly the same teacher and the same teaching are delivered (in one case by television, and in the other by conventional classroom methods) to randomly assigned groups, and all other classroom activity relating to the subject is eliminated (because it might not be exactly the same in different classrooms at different times). Only a few of the several hundred media-comparison studies in the literature meet those criteria. Most of the others are, in effect, comparisons of what a school or an organization could do at one time or place using television and at another time or place not making use of television.

The great majority of these studies--most of them in the United States--also show no significant differences. Where there are differences, more of them tend to be in favor of television than not. For example, the Chu-Schramm book was able to identify 411 comparisons of ITV with conventional teaching. Of these, 308 showed no significant difference; 63 showed more learning from television, 50 more learning from conventional teaching. By some people, this will be read as a condemnation of ITV. If it is no better than conventional teaching, why use it? On the other hand, even if we disregard the fact that much of the television was probably amateurish and many of the tests insensitive, and that the results can be explained in terms of the normal curve, still we must remember that most of the experiments took place where there were highly trained American teachers in highly equipped American classrooms. In this country, television has tended to be first tried and most used where it is least needed--in the wealthy suburban school systems. It is not entirely surprising that one of these teachers in a studio would be able to do no better or little better than a teacher of equal ability in the classroom. But consider a different situation. Consider Niger, where only 66 teachers in the entire country have gone as far as secondary school; or India, where about one third of the teachers have not had teacher training. Consider the bare classrooms of most developing regions. Here there may be more reason to share excellent teachers and interesting demonstrations by television. In those cases, if a master teacher can be as effective in the studio as in the classroom, then he can be effective in hundreds or thousands of schools, rather than limited to one.

How does television compare in effectiveness with the other instructional media? There are very few such comparison studies in the research literature. Early in the history of television, an experimenter could get more learning out of a class by telling the students that they were seeing a television recording rather than a film, but this novelty effect has now passed. There have been studies showing that audiences remembered more from television than from radio newscasts carrying the same items. But in general, experience reports and case studies tell us more about this than do research comparisons.

Where a school or a teacher has a choice of using television or radio, television is almost always chosen, except sometimes in the case of music or foreign language. On the other hand, where only radio is available, the results are usually good. Thailand has got good results from teaching 800,000 students partly through radio (UNESCO cases, Volume I), and a number of experiments with radio are listed in the Chu-Schramm summary. The chief advantage of radio over television is economic. Radio costs one-fourth or one-fifth as much as television. Thus, for example, Thailand can deliver radio to some hundreds of thousands of students for about one cent per student hour. Colombia can deliver television to some hundreds of thousands of students for about 5 cents per student hour. On the other hand, television has the great advantage of being able to deliver a picture along with sound. One would never choose to teach science or agriculture by radio, if he thought he could use television for it. It also has the advantage of attracting more attention and interest.

So far as the research tells us, there is very little difference in learning from films and from television, when they are used the same way. Both have been used successfully to teach a wide variety of material at many different age and grade levels. The great advantage of films is that the teacher can stop the film at any point to talk about it, repeat part of it, or review the whole film if necessary; and he can schedule it for any desired time, assuming it can be obtained at that time. The teacher has no such control over television. On the other hand, it becomes a major problem to have films available and to deliver them on call over a large area and to many schools. In this kind of situation, the supposed advantage of the teacher in being able to schedule a film when he wants it entirely disappears. When the service area reaches a certain size, there is a cross-over point at which unit costs of delivering television by open circuit become less than those for delivering films otherwise. This relationship has been figured out theoretically and seems to come at a fairly early point in expansion of the system. A further advantage of television is that it can be changed and updated easily and quickly. This is why films tend to be used as supplementary teaching aids, directed at a few key points in a course, whereas television has more often been used as an integral part of the classroom experience, scheduled regularly day after day or week after week.

The point seems to be that any of these media can be used effectively, although in a given situation one may be more desirable than another. Where television is not readily available, for reasons of cost or equipment, then radio can do much. Where the service area is not too large to make delivery difficult, where a sufficient supply of films can be obtained, and where it is not necessary to use them to teach the core of a course, then films have certain advantages over any other medium. Television is the most flexible, the easiest to deliver, of these instructional media. The number of television receivers in American public schools is now reported to be passing the number of film projectors, despite films' head start of several decades. In developing countries where projectors are scarce, film collections sparse, distances great, and delivery difficult, the ability to deliver picture and sound electronically seems even more of an advantage than in a highly developed country.

How can a country maximize the effectiveness of ITV?

Which medium is used, therefore, will depend on what a country or a school system can do, what its needs are, and the conditions under which it has to work. But if it uses television, what can it do to make it as effective as possible?

Here we get some help both from the case studies and the research reports. In the first place, it is clear that there is no substitute for a good signal and prompt technical maintenance. Several developing countries have floundered in television simply because of technical inadequacy (UNESCO cases, Volume III).

Second, there is no substitute for interesting and skillful programming. Many schools have produced indifferent television because they have assumed that they could put a teacher in front of a camera and have her do what she does every day in the classroom. Television is a more demanding taskmistress than that. Teachers realize this, as soon as they have a little experience in the studio. They find that they need more careful preparation, more attention to visual materials, more consideration of pace, review points, and questions to be answered before they are asked. And an agriculture program, too, is more demanding than the talk an agriculture agent would be giving in a village. Yet the whole implication of the research (see the summary in the final chapter of Chu-Schramm) is that effective use of television for instruction grows out of the basic requirements of good teaching, rather than out of any fanciness that might be peculiar to television. The qualities that emerge as determinants are factors like motivation, simplicity, good organization, practice, knowledge of results, rest pauses at appropriate points, cues that direct attention to the most important points to be learned, and so forth.

In the third place, it has become increasingly apparent in the last ten years that the effectiveness of television for teaching, whether in the schools or the villages, depends to a large degree on the context of learning activities that can be built around it. It is not generally realized that television is used by itself hardly anywhere in the world to do an important teaching job. It is always built into a system. In the school, this includes the classroom teacher; and if that teacher is hostile to television and unwilling to build it into the classroom learning activities, then it will not be very effective. In teaching literacy, television is combined with a learning group and a supervisor. Agricultural programs work best when combined with the ongoing consultation of the agricultural officer and preferably into a discussion group of farmers, as is now done in India. In a sense, television works best in a kind of team-teaching situation--the teacher in the studio, the teacher in the classroom (or learning group supervisor or village level worker), and perhaps other teachers or writers preparing study materials--all these sharing the duties of providing learning opportunities around the receiving end of the television.

These general findings and others are discussed at some length, especially in regard to developing countries, in Schramm, Coombs, Kahnert, and Lyle, The New Media: Memo to Educational Planners (UNESCO: Paris 1967). Among other things, these authors conclude that television works best when it is not used "gingerly." Many uses of television have proved insignificant because the medium has been introduced without any clear idea of the need for it, because "we ought to try out a little television," or simply because television time becomes available. The most successful uses have been those when an entire country or an entire school system felt deeply a need for the kind of help television could give--for example, when Samoa wanted to jump from 18th to 20th century education in a few decades rather than a few centuries; or when the Republic of the Niger wanted to bring some hundreds of thousands of children into school but faced an impossible shortage of trained teachers. In that kind of situation, there is some hope that television will be introduced in sufficient size to bring down the unit costs and that teachers, administrators, and legislators will take it seriously, cooperate, support it adequately, and learn to use it well.

Essentially, the attraction of instructional television to a developing country is that it can share excellence. It can share a good teacher with many classes, rather than one. It can carry a variety of auditory and visual experiences and demonstrations that would be impossible for an individual classroom or village, but not impossible for a central programming service. It can carry teaching where there are no schools. It can continue the training of teachers and development workers without bringing them into school. It can hold up a pattern of skill and knowledge for a whole country. These things do not happen automatically with the introduction of television, of course; they require skill, planning, investment, and organization.

How effective is television in developing regions?

The question that inevitably arises is how well television can serve a developing country, where many of the needed resources may be in short supply.

There is now enough evidence to know that it can be and has been used effectively as a tool of education and development, for a variety of purposes, in many developing regions.

The UNESCO volumes include case studies of television used for upgrading instruction in Niger, Nigeria, Colombia, and Samoa; for teaching teachers, in Algeria, Colombia, Nigeria, and Samoa; for extending the school, in Peru; for literacy and fundamental education, in the Ivory Coast and Peru; for adult education and community development, in Colombia, Peru, and Samoa. In addition to these we have studies of literacy teaching in Zambia, remedial instruction in Turkey, community development in Taiwan, improvement of secondary schools in Chile, agriculture and village development in Senegal, and so forth, in addition to the Indian studies cited at the beginning of this chapter. There have been many other uses, not formally studied, in such countries as Kenya, Uganda, Sierra Leone, Rhodesia, Egypt, Jordan, Pakistan, Singapore, Korea, Mexico, Jamaica, Brazil, and Venezuela.

In general, the research results from such studies as exist in developing countries are quite encouraging. For example, let us take Niger, where a team of French scholars studied the introduction of television, one grade at a time, to share the handful of well-trained teachers as widely as possible. We have at hand the results of the first full year of teaching, in which the performance of first-grade students taught partly by television was compared with the standard average for students in that grade. It was found that:

- 79 percent of the television students scored better than the standard average in spoken French.

- 88 percent scored better than the standard average in reading.

- 56 percent scored better than the standard average in writing.

- More than half scored better than the overall average for arithmetic, but their performance varied with the level of abstraction. In concrete problems, 89 percent were better than average; in semi-concrete problems, 87 percent; in mental problems, 75 percent; in applied, written problems, 50 percent; and in abstract, written, 33 percent.

The Niger examiners concluded that television in the classroom would not only produce satisfactory learning, but would considerably improve class performance over what it had been. (Lefranc, UNESCO cases, Volume II).

In Samoa, the high school entrance examinations at the end of the first two years of the television experiment made it possible to compare public school children who had been taught by television for two years, with those who had been taught in that way for one year, and with others who had received no television teaching at all--and all these with another group of children who had been taught throughout the eight grades in private schools by American teachers. This first set of test results--necessarily tentative pending later results--indicates that children who have had television for even one year do considerably better in the entrance examinations than those who have had no television. Those who have been exposed to television teaching for two years do about as well as the private school students taught by foreign teachers. (Manuscript, personal communication.)

In Colombia, some thousands of children taught in part by television were tested against a comparable group taught from the same syllabus without the aid of television. This kind of comparison, of course, is subject to the same doubts that surround all the other media comparison studies. Nevertheless, it represents what the Colombia schools were typically doing without television, as compared to what they were able to do with television. Eight meaningful comparisons were possible. In three of them, the television students did significantly better; in the other five, the differences were not significant.

In the Ivory Coast, it became desirable to teach 800 workers to read, write, and figure, so that they could be promoted to middle-level supervisory positions in the growing Ivorian industry. Few qualified teachers were available, but some of the best ones were put on television, and the workers were gathered together one hour each day in groups supervised by a monitor from their industry. The experiment was a success, and most of the 800 are now in their new positions in the native industry. (Kahnert, Capelle, and Lyle, UNESCO cases, Volume II).

In Turkey, television recordings were used in teaching physics. The results were most interesting. Without the recordings, there was a wide difference between the performance of the students who had experienced teachers and those who had inexperienced teachers. When the recordings were made a part of the course, however, the classes with inexperienced teachers did as well as the other classes (Turkish Ministry report, 1961).

From many countries come reports of the effectiveness of television in teacher training. In Algeria, for example, a combination of television and self-instructional materials, intended for teachers, was tested against a comparable group taught the same material in the classroom. The TV-self-study group did notably better. (Lyle, deJong, Kahnert, and Lestage, UNESCO cases, Volume II). In Colombia, an inservice course on the new math was given by television to about 1,500 teachers. The amount of learning was impressive. The more programs a teacher viewed, the more he learned. And if a teacher viewed in a group, or in combination with a class, he learned significantly more than if he took the class only, or viewed without a group or a class. (Schramm, Coombs, Kahnert, and Lyle, The New Media, 1967). From many other countries come reports, without research data, that merely seeing an expert teacher on television handling the subject matter taught in the classroom, has a profound and salutary effect on the performance of the classroom teachers themselves.

Another general finding of the studies from the developing regions is that television has a considerable power to motivate students, whether school children or adults. The research team in Niger reported (in the study cited above) that the first-grade students taught in part by television were happier, more spontaneous, far more interested in attending school. Unlike the other schools, there was almost no absenteeism in the television classes. "They not only come to school," the researcher said, "but they come early in order not to miss the first television transmission!"

In Zambia, Cripwell, in a study published in 1966, reported that literacy classes taught by television had a far more satisfactory attendance record than classes in the adult education centres where television was not available. "The holding power of television is a most important advantage," he said, "as one of the failings in many courses for adults, such as [these] is that the normal dropout makes it almost impossible to run the courses efficiently." This is supported by a recent report of the NHK Television-Radio-Correspondence School in Japan (which is, of course, not to be considered a developing country). This school has just graduated its second class in a four-year curriculum of secondary school for employed young people. Television is an integral part of the curriculum, along with the usual correspondence study. The percentage of completion, the school reported, was the highest ever obtained by a correspondence school teaching secondary school subjects.

Are there special problems in using modern media to teach or inform village people?

This question remains: Are illiterate village people able to learn from television as readily as city people?

There are a number of studies in the literature (see the summary by Chu and Schramm, pp. 37 ff) indicating that illiterate people often have to learn pictorial conventions that are familiar to mass media users. For example, when Peruvian villagers saw a health film showing enlarged pictures of lice, they thought these were an entirely different species of animal--not the little lice with which they were so familiar (Holmberg, 1960). Court, in a 1959 study, found a Nigerian audience unable to understand at first the perspective in a picture. Fonseca and Kearl (1960) found that rural Brazilian audiences had difficulty in relating pictures of different parts of a process to the entire process. Spaulding (1956) found that realistic pictures were much easier than line drawings for rural people in Costa Rica and Mexico to understand.

Conclusions

The research and case studies, then, leave us little doubt that ITV can serve as an efficient tool of learning. This is not to say that it always does. But the evidence is overwhelmingly that it can, and, under favorable circumstances, does. This evidence comes from many countries, developed and developing; from studies of all age levels, preschool to adult; and from a great variety of subject matter and learning objectives. The questions that now seem worth asking, as we contemplate the potentialities of educational and developmental television for India, are not whether viewers can learn effectively from it, but rather, (1) does the situation call for it? and (2) in the given situation, how can it be used most effectively?

Appendix B

FIELD TRIP NOTES

In this appendix, information collected during the field trip is presented, particularly the information that has not already been used in the main body of the report, but which may be of some value to other investigators. The notes have only a rudimentary structure: a rough summary of the problems the country faces in educational development is presented first, followed by a discussion of existing and projected use of educational broadcasting. No attempt has been made to convert these notes into comprehensive statements; readers familiar with the countries will no doubt find many omissions, and perhaps some errors that result from the brevity of the team's visits.

At the beginning of each country report is a list of persons interviewed, arranged in two groups, host country personnel and U.S. representatives.

PERSONS INTERVIEWED--ARGENTINA

Alfredo C. Suescun, Channel 13
General Solari, Minstry of Education
Father Hector Grandinetti, ETV, University of Salvador
Llerana Amadeo, Culture and Education, University of Salvador

Brandon Robinson, USAID

FIELD TRIP NOTES--ARGENTINA

A high literacy rate (91.6 percent of the population over 14 years of age, in 1960) and high enrollment ratios relative to other Latin American countries might suggest that Argentina's educational development problems are well in hand. However, serious problems do exist, including high attrition, lack of consistency between enrollment and manpower needs, oversupply of primary school teachers, disparity between the quality of urban and rural schooling, and obsolescent content and pedagogy in much of the educational system.

Argentina invited OECD (Organisation for Economic Cooperation and Development) to assist it in preparing a thorough study of human resources development for Argentina. The OECD report has been submitted, and the Argentines are now preparing a companion report for correcting various deficiencies uncovered in the study.

Argentina has made little effort to improve educational opportunity through the use of broadcast media. There are about 30 open-circuit television stations throughout the country, yet no comprehensive ETV projects. There are about 20 closed circuit systems operating in educational institutions, but little cooperation among them. There is no educational programming on the government-owned television station in Buenos Aires; the two programs of instructional material that appear one hour per day, five days a week (primary education and vocational programming), are taped and screened on the commercial Channel 13. These tapes are made available to 12 other stations in Argentina.

Although Argentina has made a formal bid to have the OAS training center in Buenos Aires, there appear to be no government plans for any extensive programs for ETV.

There exists a well-equipped school of communications at the University of Salvador in Buenos Aires. This private university graduated its first class with degrees in communication in 1967. Although the program is somewhat academic and theoretical at present, it has the potential of fulfilling an important role as a source of trained personnel in ETV. To this point, however, the students and curriculum seem oriented toward commercial television.

Argentina's need to train better teachers, especially at the secondary level, might provide an impetus to put some of the country's educational and technological sophistication into solving this problem through ETV. One education ministry official observed that it will cost 30,000,000 pesos to retrain only 100 math teachers in the new methods. There are about 4,000 who need this retraining. If the costs of retraining could be used to create a flexible system of ETV, he speculated, the job could be completed in a year or two and at about half the cost.

PERSONS INTERVIEWED--BOLIVIA

James L. Pruss, Maryknoll Father, Radio San Gabriel, and Radiofónica Schools of Bolivia
José Gramunt de Moragas, Radio Fides
Carlos Luis Quiroga Navia, Ministry of Education and Cultural, National Commission to UNESCO
Alfredo Aguirre, Ministry of Education and Culture and University of San Andrés

Vytautas A. Dambrava, American Embassy
Frank L. Holmes, USAID
Flavio E. Barbieri O., USAID

FIELD TRIP NOTES--BOLIVIA

National development, including that in the education sector, is progressing according to the Bolivian Development Plan for 1962-1971. This plan recognizes the need to reorganize the educational system and to give high priority to expansion of school enrollment. Increases of 45 percent in urban primary enrollment, 100 percent in rural primary enrollment, and an overall increase of 25 percent in secondary enrollment were envisioned for this ten-year period. By 1965, urban and rural primary school enrollments increased 7 percent and 15.5 percent, respectively, over 1962. By 1967, secondary school enrollment had increased by almost 30 percent over 1962.

Enrollment, however, is no guarantee that studies will be completed. Although enrollment has increased, the dropout rates are still so high that few pupils graduate. In secondary schools, the dropout rate is 80 percent, which is 5 percent higher than in Colombia and 30 percent higher than in Peru. At the primary level, the dropout rate is 75 percent.

Numerous teacher training programs have been initiated to improve educational standards. The Ministry of Education, with the help of USAID, has been conducting seminars for primary and secondary school teachers, including 70 to 150 teachers in each seminar. Despite the training programs, teaching posts are often vacant because of comparatively low salary levels.

Illiteracy continues to be the biggest educational concern in Bolivia. Of a total population of 3,801,000, one million are Quechuas and 700,000 are Aymaras. A generous estimate of the literacy rate might be 35 percent. Efforts to eradicate illiteracy reflect high hopes but low productivity. One recurrent problem is that literacy officials often do not coordinate their programs with the local school teachers. Another problem is the lack of follow-up with reading materials.

Use of media in education is limited at the present time to radio broadcasts, and in radio broadcasts to fundamental education. There are six radio schools currently operating (Escuelas Radiofónicas de Bolivia, or ERBOL). These are operated by the Catholic priests and are located in: (1) rural areas, such as the Altiplano around La Paz, the Cochabamba Valley, Sucre, and tropical Montero; (2) mining country at Oruro and Siglo XX; and (3) urban La Paz. The total number of students registered in 1967 was 8,300. The number who actually received diplomas for literacy numbered perhaps one-half to two-thirds that figure, with a better percentage in the urban areas than in the rural areas. The program is supported by funds from the United States, Canada, and Germany. In 1967, a UNESCO team found the program at Sucre (Radio Loyola) to be the most productive and helped to procure 3,000 to 4,000 Japanese transistor radios for the following year.

Efforts are made in the evaluation of this program to distinguish between those who register and those who actually finish the program. For example in the rural population around La Paz, 2,000 enrolled for 1967. One thousand presented themselves at the final exam, and 700 passed. Thus, it is calculated that the operating cost for 1967, which was $7,000, came out to about $10 per student graduated. It is hoped that this figure can be brought down to $3 per student graduated.

For rural La Paz, enrollment in the radio schools has now increased to 3,000 for 1968, with 190 school sites included. The Summer Institute of Linguistics has developed a new approach to literacy; literacy is taught first in Aymara, then in Spanish. This approach has been put into effect on the Altiplano this year, and so far the results look promising. Regarding the success of teaching literacy by radio, the priests feel that while, in theory, such a program should not work well, in practice the results are promising. Furthermore, although increased literacy is one aim, equally important is that of providing new community leadership. In some cases, persons who received training in monitoring radio programs have gone on to assume new responsibilities in the community.

A Spanish company called "Movierecord" has plans to set up a microwave television network extending from La Paz to four other departments: Oruro, Sucre, Cochabamba, and Santa Cruz. As of June 1968, the first equipment and technicians were arriving at these locations. Plans call for installation of television by March of 1969. Apparently the government will operate the network. The Ministry of Education is hoping to have a separate ETV and radio department. Officials envision beginning ETV with closed-circuit television at three normal schools in La Paz, using video taped programs in natural science, geography, and history. There is also the thought of broadcasting ETV programs for all ages into the homes.

But before television is introduced, education officials would like a television team to study carefully the socioeconomic realities in the country and then decide on best uses for the medium. The President of Bolivia is apparently anxious that Bolivians be trained in ETV. Offers of fellowships already have been received from Spain, England, Japan, and France, both on the technical and nontechnical aspects of ETV. With regard to training within Latin America, Bolivian officials regard Mexico as a good site for the multinational ETV training center.

PERSONS INTERVIEWED--BRAZIL

Rio de Janeiro

Arlindo Lopes Côrrea, EPEA
Cohelio Reis, CONTEL
Gilson Amado, National ETV Foundation
Paulo Diaz de Souza, Brazilian Navy
Alfredina de Paiva e Souza, ETV Center, Institute for Education
Dr. Boaventura, Ministry of Education
Paulo Dutra, Ministry of Education
Sulamita Maria Giffoni (Pôrto Alegre), Educational Foundation Father Landell de Moura
Rudolf P. Atcon, Council of Rectors of Brazilian Universities

John W. Tuthill, U.S. Ambassador to Brazil
William Gelabert, USAID
Howard Leavitt, USAID
Munroe Cohen, USAID
John Vince, USIS
Alice H. Palmer, USAID
Peter Bell, Ford Foundation
David Christian, USAID
Richard Smith, USAID
Gastão Coaracy, USAID
Stewart Van Dyke, USAID
Harold M. Midkiff, American Embassy
George F. G. Little, USAID
Charles Youmans, USAID
John M. Howe, UNESCO
Edward Ploman, UNESCO
Robert Hudson, UNESCO

Recife

Dalton Andrade, University of Rio Grande del Norte, Natal
Manuel Caetano Queiroz de Andrade, ETV, Channel 11
Murillo Guimaraes, Federal University of Pernambuco
Pierre W. Du Boise, Cruzada ABC
D. Veiz, World Council of Churches

Recife (continued)

Grant Hillecker, U.S. Consul General
John Burns, Peace Corps Volunteer
Peter Diffley, USAID
Shep Hollander, USAID
Al Bisset, USAID
Thomas Woodson, USAID
Marshall Jamison, University of Rio Grande del Norte, Natal

FIELD TRIP NOTES--BRAZIL

By almost any measure, Brazil's educational administrators face as formidable educational problems as can be found anywhere in the hemisphere. Over many years, Brazil's educational attainments, measured in terms of average number of years of schooling, have lagged behind those of other developing countries at comparable stages of economic development. Enrollment has been growing rapidly in recent years, but the 1964 school census showed that only 66 percent of children between the ages of 7 and 11 years were in school. Most of those enrolled in primary education are congested in the first two grades. Repeaters and dropouts are serious problems. Secondary enrollment is less than 18 percent of the appropriate age group total, and higher education enrollment is 1.1 percent of the 19- to 25-year age group. Great variations in access to education and in the quality of schooling offered exist between rural and urban areas and among states. Regional inequalities characterize most educational descriptors: illiteracy in 1960, for example, was 59 percent in northeast Brazil, 40 percent in the east, and 26 percent in the south. In some rural areas no schools are available. In many urban areas schools operate on two, three, or even four-shifts per day because of lack of classroom capacity.

The school census showed that 43 percent of primary school teachers had no professional preparation for teaching and 32 percent had only a primary education or less. Salaries of teachers vary from $20 (U.S.) per month in the northeast to $45 (U.S.) per month in the south. A premium is paid to attract teachers to Brazîlia, where the monthly salary for a primary school teacher is $83 (U.S.). These salaries are not competitive with those in other professions requiring equivalent preparation. Accordingly, there are serious quantitative and qualitative deficiencies in the teaching staff.

At the higher education level, Brazilian leaders are trying to deal with a number of vexing problems, including: part-time faculty and part-time students; an abnormally low pupil-teacher ratio of 4.7 (in 1964), reflecting moonlighting practices; maldistribution of enrollments in relation to capacity and to employment opportunities; fragmentation of educational authority into individual faculties instead of university administrations; and an absence of effective machinery for coherent overall planning.

During the last several years, a governmental working group has developed an education sector plan for the 1967-1976 period. It calls for rapid expansion of primary and secondary education, intensification of adult literacy programs, strengthening of the network of training centers for industrial and commercial employment, and expansion and improvement of higher technical education. In higher education, science institutes will consolidate the now-fragmented offerings, and certain graduate programs will be established or strengthened. The Brazilian government has obtained two loans totalling $28 million (U.S.) from the Inter-American Development Bank to assist in the reform of one private, two state, and six federal universities.

In ETV, 108 channels have been set aside by the Brazilian government. There are 43 commercial television stations currently programming in the country. One chain alone has 18 stations. There are, or have been, efforts in ETV in virtually every state of Brazil.

Thus far, most efforts in ETV deal with accelerated secondary education (Article 99), or with functional literacy. There is, as yet, little programming that is integrated into the school curriculum.

Brazil's three-year investment program and plan for education calls for "the use of modern media in education." However, there is no budgetary commitment so far to support this injunction. It is estimated that there are 19 million illiterates in Brazil. In September, the President announced a $275 million cruzeiro literacy program. None of this $275 million appeared in the January 1st budget.

A government-supported TV-literacy program is about to begin. This is to be received in favelas, teleclubs, private homes, or any group where at least 30 persons can meet together. In the pilot program, 4,000 persons are to be reached. The monitors in each group will be retired teachers. Since teachers in Brazil retire after 25 years and usually start work at 18, they are only about 45 years old. These people are now being trained to do this monitoring job. The armed forces will also use the literacy series for draftees who are not literate. Draftees will have to learn to read or they will not receive a military certificate. If these programs work, the series will then be extended to the entire country. Three commercial channels will be used twice each day (by law television stations are obliged to offer free time for educational programs before five o'clock in the afternoon).

The director of the Institute of Education would like to see television used for teacher improvement. He believes that such a series of programs (prepared at his institute) could be used all over Brazil. The capacity of the Institute is only 3,000 per year. In the entire country 350,000 teachers need upgrading.

The Article 99 Course in Secondary Education has been offered by radio for several years. It is estimated that 11,000 students have enrolled in the course. Seventy percent of these have passed tests given by the Ministry of Education in regular high schools. Of the 11,000 students it is estimated that around 22 percent took the course at radio posts, that is, under organized reception conditions. The remainder took the course in homes or in other locations. The monitors who serve at the radio posts were initially volunteers. This arrangement turned out to be somewhat unsatisfactory because of the great variation in the effectiveness of volunteers. Now monitors are generally paid either by the community or the city. Monitors receive only one week of training, largely in group supervision and group dynamics. Educational qualifications for monitors are minimal and often people with only primary education themselves are selected. A traveling teacher for the Article 99 program chooses the monitors and coordinates their efforts.

Students of the Article 99 course are encouraged to consult teachers in the regular school system when they need more detailed explanations than they can obtain from monitors. They are also encouraged to write to the headquarters organization. A part of the radio programming is saved for reading these letters and discussing answers to them. This provides useful feedback for the students.

The Article 99 course has now been put on video tape and is being offered through that medium by the official government ETV authority. It is too early to say how many viewers are receiving the program.

The ETV group in Pôrto Alegre has produced two programs, one on electricity and one on mechanics. Apparently, the level of these programs is what could be called pretechnical or prevocational. The director of the programs studied ETV production at CETO in England. This system is co-sponsored by the vocational education part of the Federal Ministry of Education and by local companies in Pôrto Alegre. Programs are broadcast over two local commercial stations, and tapes are sent to outlying stations. The effort seems to have had considerable impact, despite a small budget. However, no firm plans exist for its continuity, although new programs on traffic safety and on mechanics are in preparation.

The Ministry of Education's vocational program recently contracted with SENAI and SENAC to carry out an expanded vocational education program. SENAI was the first Latin American Industrial occupational training organization, having been formed in 1942. SENAC trains for the commercial sectors. In 1967, SENAI served 71,000 trainees in 81 centers located in each of the states of Brazil. Perhaps an additional 200,000 benefited from in-company training to which SENAI provided some technical assistance. However, SENAI and SENAC are not reported to have plans for using ITV.

There are currently three ETV projects of major proportions underway in Brazil. A commercial station in São Paulo was jointly purchased by the state ministry of education and a foundation set up to run the first ETV station in Brazil. This station has been experimenting during the past year with various kinds of programming and will begin officially sometime in the Fall of 1968. The philosophy behind the programming seems to have two tenets: (1) produce interesting programs, by hiring such stars as futbolista Pelé, and (2) produce cultural and enrichment-oriented, rather than purely instructional, programs. One factor in favor of this approach in São Paulo is that this state has the best educational system in Brazil and does not need core courses as much as other parts of the country.

The second project is in the northeast. Recife's channel 11 is an educational station connected with the University of Pernambuco. It is well along with construction and should be ready to program in September. It will be a modern and well-equipped station but will probably demand a budget of somewhat more than the $500,000 that is anticipated. The plans for its use are ambitious. The head of the station, Professor M. Caetano Andrade, is going into immediate production to supply four educational curricula with a starting audience of about 20,000 gathered around 600 receivers to be distributed in the area around Recife. The four levels are: first year of primary; first year of ginasio (academic secondary); first year of ginasio menor (vocational secondary); and admissão (the year of review usually necessary for graduates of primary to pass the entrance exams for secondary). The courses for all of the levels will be given in 13-minute segments in subjects ranging from history and Portuguese to math and science. All instructional programming is scheduled for the time between 8 and 12 a.m. Teleteachers and script writers are being hired and trained. Professor Caetano has also undertaken some programming in the evening. Fortunately, however, much will be video taped, and the Ministry has bought some time for Article 99 courses. Evening programs will run from 6 to 11 p.m.

The third project is the National Center for ETV. This is an effort by the federal government to coordinate all ETV in Brazil. Mr. Gilson Amado has been appointed to head the Center, and money has been provided by the national budget. The Center will produce programs but will not be a transmission station (at least at the beginning). Production will be accomplished in commercial facilities for at least a year or two. It is planned that the Center will also produce printed backup materials. These would be provided to states, municipalities, and private organizations that would organize the audience and find time on existing television channels in their local area.

Mr. Amado is particularly interested at this time in helping to educate the young adult dropout group (from 18-30) and feels that this should have priority for the present. Later there would be other types of instructional programs developed for the formal school system.

PERSONS INTERVIEWED--CHILE

Patricio Rojas, Ministry of Education
Mario Leyton, Ministry of Education
Ernesto Schiefelbein, Ministry of Education
Renée Viñas J., Ministry of Education
Valdemar Cortés, Ministry of Education
Alfonso Bravo, Ministry of Education
Oscar Vera, University of Chile
Simón Romero Lozano, UNESCO
Luz Vierra, UNESCO
J. Manuel Calvelo Rios, ETV team from University of Buenos Aires
Bartolomé Dezerega .University of Chile
Guillermo del Campo, INACAP
Augustin Alberti
Osvaldo Sepulveda, Channel 9
Juan Angel Torti, Channel 9
José Luis Contreras, Channel 9
Adriana Brogliero, Channel 9
Eliodoro Rodríquez, Channel 13
Eduardo Tironi, Channel 13
Enrique Smith, Channel 13
Pedro Caravall, Channel 13
José Contreras, Channel 13
Osvaldo Bazélatto, Channel 13
Santiago Astraín, INTEL
Padre Patricio Caviola, S. J., Headmaster, private secondary school

Mr. Weintrab, USAID
Mr. Echols, USAID
Luis G. Sleeper, USAID
Edward Korry, U.S. Ambassador to Chile
Robert S. Myers, USIS, American Embassy
Harry H. Kendall, American Embassy
Marshall Wolfe, ECLA
John Netherton, Ford Foundation
Bruce Gibb, Ford Foundation
Duane Rogers, USAID
Mr. and Mrs. Cristensen, University of Minnesota, researchers in Chilean television

FIELD TRIP NOTES--CHILE

Although Chile already ranks considerably above other countries in the Andean group according to such educational indicators as percent literate and enrollment ratio at primary and secondary education levels, it has embarked on an ambitious educational reform and expansion program. This program has received broad and flexible financial and technical support through an education sector loan arranged with the Agency for International Development. Under the reform program, access to primary schooling has been extended by the building of rural schools, new instructional materials have been made widely available, teachers are being retrained and upgraded, planning of regional educational centers at the secondary level is under way, and vocational education facilities are being consolidated and strengthened. With external assistance, principally from the United States, the Chilean government hopes to implement the reform program fully in six years, instead of the 15 years that would be required without external aid.

High priority is now being accorded the inservice training of teachers at primary and secondary levels. The purpose of this program is to upgrade the teachers' knowledge of content and to encourage inquiry-oriented pedagogy--a departure from traditional patterns of autocratic, one-way teaching. However, the Centro de Perfeccionamiento, which is responsible for teacher retraining, has reached only a few thousand teachers and continues to fall further behind as more inadequately trained teachers enter the force.

ETV in Santiago, Chile, consists of a unique arrangement of what are, in effect, commercial stations operated by universities: Channel 9 by the University of Chile and Channel 13 by the Catholic University. There appears to be a good deal of interest in developing a third channel to operate directly under the Ministry of Education.

The programming of both Channels 9 and 13 relies heavily on United States commercial television programs. (Peyton Place is the most popular program on Channel 9.) At its inception, Channel 9 received some support from the University of Chile; it is now entirely supported by commercial activities, which constitute 95 percent of its schedule. In 1967, it received 500,000 escudos (U.S. $67,000) for equipment from the Chilean Congress.

Channel 9 operates early in the morning and again from 5 in the afternoon until late in the evening from a complex of studios. Educational programs are broadcast from 6:30 to 8:00 a.m., although not continuously within that period. Programs include languages, chemistry, and mathematics. These are auxiliary educational programs and are not directly associated with any school or college or credit arrangement. Channel 9 equipment includes: eight Fernseh (German) three-inch image orthicon cameras, five of them new; two Ampex 1200 tape recorders; a new 5-kilowatt Phillips transmitter, with a 12-gain antenna located on a hill above Santiago. The managers state that the operating budget is 125,000 escudos (U.S. $17,000) a month and that there are 130 full-time employees.

Channel 13, at the Catholic University, operates without financial support from the University. It has a full-time staff of 200 and gives 750,000 escudos (U.S. $100,000) as its estimated monthly operating cost. The discrepancy between the figures for the two stations is inexplicable, but repeated questioning did not elicit a revision of the latter figure. The equipment of Channel 13 is less sophisticated and older than that of Channel 9 and includes three vidicons and three image orthicons--two Sarkes Tarzian and one RCA TK-15. Channel 13 is producing some educational programs in seventh and eighth grade natural science, under the guidance of a Father Cariola. These programs are now being used in 34 schools. The programs are written by full-time school teachers, who contribute to the television programs as an additional activity. The program we saw was well done. It relied heavily for its basic content on an Encyclopedia Britannica Film, but integrated the film very well with local studio production. Morale and self-confidence on the part of the staff appeared very high and was justified.

Channel 8, at the Catholic University of Valparaiso, is similar to the two Santiago channels. Its interest in educational programming, however, is somewhat greater than that of either Channel 9 or 13. It has produced some teacher training programs and schedules about six hours of ETV programs a week. The Universidad del Norte, at Antofagasta, has a small group producing educational programming, but it is just beginning and will probably follow the pattern of the other three "university" stations. Currently, Antofagasta has only a television camera and a small Sony video tape recorder.

There has also been some closed-circuit equipment at Concepción University, set up by an adviser from the University of Minnesota, but this seems to have been peripheral and of no sizable effect on the educational system.

An interesting development in ETV was the importation of several refugees from Argentina, who had established a closed-circuit television system at the University of Buenos Aires. The Ford Foundation is sponsoring their work in Chile, and the Ministry of Education is to supply them with equipment. Most of the equipment is presently installed in an old mansion in Santiago, but several critical pieces are still missing--a transformer to stabilize current, for example. In their first year in Santiago, they have studied the teacher training curriculum and have prepared scripts; but they have yet to engage in production, partly because of the lack of equipment, but also because of reported resistance from teachers in the Centro de Perfeccionamiento, with which they were to work.

There is talk of establishing a third ETV channel that would develop into a government-owned national network capable of reaching 80 percent of the population by 1971 or 1972. (At present, only 40 percent of the population is within reach of television signals). The existing stations would not be suppressed, but they would not be given any opportunity to extend their signals. The "national channel" would be sponsored by the Ministry of Education, and the Ministry is currently concerned with training personnel for this ETV channel. The Ministry feels that the university channels have not developed adequately in educational programming. Twelve men are soon to be sent to France for training, and talks are underway with other countries concerning additional training possibilities.

The Ministry of Education has generally been interested in multilateral cooperation in television and has submitted to the OAS a proposal for a multinational production center. The Ministry is interested in multinational program exchange and in working toward some common Latin American curricula, with particular emphasis on the sharing of science programs. They referred to the potential for "a common market for education in Latin America."

In 1965, Channel 13 experimented with televised rural education through teleclubs, but this effort failed. Currently, Chileans see inservice teacher training, primary school science, and mathematics as priority areas for ETV.

INACAP is the Chilean occupational training organization serving industrial employers. Its only use of television thus far was a weekly 30-minute program broadcast over the Valparaiso television station. The objective of this program was to awaken interest in the general viewing public in technical studies and thereby to increase enrollments in INACAP training schools. The television program was credited with doubling local enrollments. INACAP is now considering the use of television in its training classes, but has not yet made any commitment to produce a series.

PERSONS INTERVIEWED--COLOMBIA

Gabriel Betancur Mejía, Minister of Education
Aurelio Céspedes, Ministry of Education
Eduardo Martínez Esponda, Ministry of Education
José Thomas Moore, Ministry of Education
Madedonio Valderama, Ministry of Education
Aureliano Rueda Olaya, Ministry of Education
Rosa López de Manigat, Ministry of Education
Florángela Hernández S., Ministry of Education
Elías Ortega Campo, Ministry of Education
Augustín Lombana, Ministry of Education
Joaquín Páez-Gómez, University of the Andes (interviewed at Stanford University)
José Galat Noumer, Presidential Advisor and Fondo de Capacitación Popular
Father Valserra, University of Javeriana
Father Alfonso Quintana, University of Javeriana
Sister Mary Loftus, University of Javeriana
Armando Vargas Otálera, University of Javeriana
Pilar Santa María de Reyes, National Radio and Television Institute
Dr. Fadul, National Radio and Television Institute
José María de la Torre, Acción Cultural Popular
José A. Salas, Radio Sutatenza
Representative for Pilar Caballero, University of the Andes
Alberto Ospina, Consultant
J. A. Pulido T., National University
René Corradine, University of the Valle
Dr. Lozano, TELECOM
Leonardo Gómez, TELECOM
Boris Plazas, Ministry of Telecommunications
Dr. Robira, Ministry of Communications
Teodoro Echeverri Ruiz, SENA
Rodolfo Martínez Taro
Dr. Rubiano
Guillermo Fernández, UNESCO

Sidney Norris, Peace Corps Staff
Graig Hobbs, Peace Corps Volunteer
Judy Vogel, Peace Corps Volunteer
Marvin Weissman, USAID
Howard Lusk, USAID
Edward V. Schten, USAID
E. Clayton Seeley, USAID
Mr. England, USAID
Rodolfo Low-Maus, Ford Foundation

FIELD TRIP NOTES--COLOMBIA

Ministry of Education officials in Colombia list major educational problems as follows:

- More than 50 percent of primary-age children and at least 70 percent of secondary-age children are not enrolled in school.
- Primary school teachers are poorly trained, with the best having only normal school diplomas. Training among secondary school teachers is even less adequate; perhaps 30 percent have no titles (teaching certificates) and, at best, possess a high school degree.
- The dropout rate is high, reaching 80 percent at the primary level.
- Teaching practices encourage rote memorization instead of problem-solving.

Educational policy-makers want to reform teaching and learning practices toward inquiry-oriented and problem-solving techniques. They want to provide full access to primary education by building new schools. There is also a desire among education officials for improved educational administration, without which modernization cannot proceed.

The educational problems of Colombia are compounded by the country's high population growth rate of 3.2 percent and the shift of population from rural to urban areas. Bogotá is reported to be growing at the rate of 7 percent per year.

The Colombian government has arranged for the assistance of the World Bank and USAID in the development of a new comprehensive secondary school system. A total of 19 schools will eventually be constructed. It is hoped that these secondary schools will provide new career alternatives.

Colombians concede that there has been a proliferation of institutions of higher education, with a resulting lowering of quality of offerings. The government has undertaken to improve the situation, with the assistance of a number of external agencies.

ETV is well-developed in Colombia, compared to its progress elsewhere in Latin America. There is a network of 14 transmitters that delivers primary education programs to 1,100 primary schools, concentrated largely in the central and northern regions of the country. Most of this network, under the direction of the INRT (Instituto Nacional de Radio y Televisión), is not microwave-interconnected, but consists primarily of off-the-air repeaters. Because of this and the low power of many of the transmitters, signal delivery is poor and sporadic. INRT hopes to improve this situation by developing a microwave network that will interconnect the stations. It does not appear that funds are available for this purpose. Telecom, which is charged with the responsibility for telephonic communications in Colombia, is currently expanding its microwave network and considering the possibility of making a television channel available. But, again, the costs appear to be excessive.

Other difficulties help to account for the failure to use ETV programming in more than 1,100 schools. Under the original USAID contract, 1,500 television sets were made available to INRT. More sets are needed, but the Ministry lacks the funds to provide them. However, no further external assistance in procuring additional sets seems to be forthcoming.

The annual budget for ETV is about $390,000 (U.S.) annually ($6,145,751 pesos). The staff is ample and the quarters have been newly remodeled. Expansion to a second studio facility is currently underway. Equipment includes a 4½-inch image orthicon camera and an Ampex quadrature head. There have been maintenance and operating difficulties, due in part to the complexity of the equipment and in part to inadequate air-conditioning of tape storage and tape machine operating spaces.

Colombian ETV has programmed first, second, third, and fourth grade materials in math, language, science, music, and social science. For upper elementary grades, English and French are provided. Inservice teacher training is also televised, as are health, nutrition, and child care for mothers at home and community action programs for adults.

Another program that includes extensive use of ETV is the new fundamental urban education program, called Capacitación Popular. The program's chief aim is to offer televised literacy classes to illiterates in the urban areas, many of whom have recently arrived from rural areas. As the program progresses, it is intended that such subjects as hygiene, home economics, community organization, civics, and religion will be added to the curriculum. Monitors for the telecenters will be recruited on a volunteer basis. A commercial bank in the United States has agreed to build a television station, and 1,000 television sets will be purchased from Spain in exchange for coffee. Plans call for transition from closed- to open-circuit operations in August of 1968. Broadcasts at first will be limited to two hours daily, and later will be extended to six hours. One highlight of the project has been the attempt to research each new step before taking it. Critics fear, however, that there are not enough personnel with ETV experience on the staff.

Radio Sutatenza provides fundamental rural education to the entire campesino population (some 12 million people). The Colombian government supports the program with $312,000 (U.S.) annually. The organization has about 30,000 volunteer workers, 3,000 of whom have been trained as auxiliary teachers. Only 200 people are on the regular payroll. Publications include manuals on health, agriculture, literacy, and math, and a weekly journal. Issues of the journal are published in quantities of 60,000, and they are sold for less than cost.

Although the success of Sutatenza's 20 years of work in radio education has not been measured systematically, there are indications to show that its strong network of monitors and publications has provided an important capability for the dissemination of fundamental education. Often other Latin American countries have looked to Sutatenza as the model for their own radio programs. Sutatenza is currently considering the transition to television, but only if low priced transistorized television sets can be made available. Most of the listening posts of the membership do not have electrical power.

On a closed-circuit basis, there is limited activity in ETV at the University of Javeriana. There are, for example, experimental courses in biology that are prepared on video tape. Javeriana's microteaching program is training 40 secondary school teachers annually. At the National University, there is a small audio-visual group that has plans for expansion into a 2,500-MHz television system witnin the next year. These plans call for teaching of introductory university courses in math and science for students in the first two years. The University del Valle and Antioquia also have tentative plans for ETV.

Tentative plans call for the use of ETV in the new comprehensive secondary schools. If this use of ETV is approved, then the four universities--Javeriana, Nacional, del Valle, and Antioquia--will be adequately equipped to provide televised courses and teacher training by 1970 or 1971.

Officials hope that Colombia will become the site of the new OAS multinational center for ETV. Interest in ETV is evident, even at the highest levels of the Ministry. New, innovative ideas are being generated by an increasingly significant number of young specialists, often trained abroad, who are intent upon upgrading education through the use of new technologies.

PERSONS INTERVIEWED--COSTA RICA

María Eugenia Dengo de Vargas, University Costa Rica, Education School
Otto Jiménez Quiros, Vice-Rector, University Costa Rica
Ilse Hering de Arila, Ministry of Education

Temple Wanamaker, USIS
Patrick Olinde, USAID
Edward Casey, American Embassy

FIELD TRIP NOTES--COSTA RICA

Nearly all educational indicators rank Costa Rica high among Latin American countries. The literacy rate was 84 percent in 1963; the enrollment ratio of primary school children was 93.5 percent, and the enrollment ratio for secondary school age was 25.9 percent in 1965. Access to education is reasonably equalized between urban and rural dwellers.

The Ministry of Education and the National Apprenticeship Institute (founded in 1965, with technical assistance from Colombia) are seeking to make education and training more relevent to economic development needs. Technical education is being strengthened. The Ministry of Education is also trying to reduce student-teacher ratios in primary and secondary schools.

Costa Rica also ranks high among Latin American countries with regard to broadcast media. Its population of 1.5 million inhabitants owned about 350,000 radio sets in 1966. The ownership and listening patterns showed that little differences existed between the urban and rural sectors of the population.and the audience coverage of the 34 radio stations was estimated to be over 90 percent throughout the nation. There are three commercial privately-owned television stations in San José. These, with a few repeater stations, reach approximately 80 percent of the national population. An attempt to begin an ETV station (Channel 2) recently failed, and now a commercial group is planning to reopen it as the fourth channel. A microwave link with Mexico and Panama is planned for by about 1970. This would provide a link with all other central American countries, as well as a two-way link with INTELSAT ground stations in the north and south.

Costa Rica at present makes little educational use of broadcast media. The university has its own station and produces largely cultural programs (music, drama, and so forth), although it does present one short agricultural program each day. Since agriculture is the primary source of economic wealth, there are several other agricultural programs, one from the Ministry of Agriculture and one from a private group. There are occasional television programs that are of an educational nature, but there exists nothing like a consistent series of instructional lessons in any area.

Costa Rica, then, has both assets and liabilities with regard to future use of television for education. Its assets are: (1) a relatively high literacy and educational level, an adequate primary system and a fairly stable and advanced economy; (2) three or four television stations and 34 radio stations that already have the capability of reaching a major part of the population, both urban and rural; (3) established educational priorities in areas of teacher training for secondary schools, provision of secondary schooling for young adult dropouts (ages 18-30), and an improved science and math program for secondary and introductory university courses (in collaboration with the National Science Foundation). On the other hand, there are liabilities facing the use of television in meeting these and other priorities: (1) Costa Rica already spends a maximum amount of its funds on education; (2) with a relatively high educational standard already achieved, the urgency of using the media to solve educational problems is less pressing; (3) there are no trained personnel in ETV and little leadership to promote its adoption; (4) the Ministry of Education seems rather more interested at present in creating an audio-visual center and promoting classroom use of audio-visual material.

The prospects for adoption of ETV are somewhat doubtful (as of May 1968). There is the possibility, however, that the University will be given an extra $30,000 (U.S.) by the government to buy some equipment for a small television production studio. The priorities that the University's Dean of the School of Education sees for ETV are: secondary education for young adults (ages 18-30), and teacher training for secondary teachers. The vice-rector seems interested in the use of television for math and science in secondary schools. It appears clear that secondary education is the level that requires immediate assistance, and it is here that ETV might make a significant contribution.

PERSONS INTERVIEWED--EL SALVADOR

Dra. Chávez, ETV Center
Leonidas Aparicio Girón, Ministry of Education
Margarilio Calderón Figuerda, Ministry of Education
Delfín Tesorero Tadeo, Ministry of Education
Joaquín Recinos Martínez, Ministry of Education
Eduardo Bolaños Santos, ODECA
Mr. Benecke, Minister of Education

L. Paul Oechsli, USAID
Albert J. Linstad, USAID
Theodore T. Foley, USAID
Hal Johnson, USAID
T. G. Leonhardy, American Embassy

FIELD TRIP NOTES--EL SALVADOR

Educational reform has produced a rapidly growing school population. At both the primary and secondary levels, enrollment has increased approximately 35 percent between 1964 and 1967. Plans call for a further increase in primary enrollment from 450,000 to 600,000. Nevertheless, the dropout rate at the primary level is about 80 percent. As in Uruguay, it is hoped that the basic educational level can be raised from sixth to ninth grade.

There is now a surplus of primary school teachers and a shortage of secondary school teachers. Consequently, the Ministry of Education is attempting to close down the normal schools and so far has decreased the number from 52 to 5. Eventually, it is hoped that the normal schools will be phased out completely and that all teacher training will be conducted at the new educational center in San Andrés (also the site of the new ETV production center). Teacher training will then concentrate entirely on retraining the primary school teachers at hand, both for secondary posts and for improved primary instruction.

To meet the educational expansion, expenditures for new school facilities are needed. Rough figures call for 3,500 new schools. Under existing conditions students will have to attend school on double shifts, particularly in rural areas. The government already allocates 24 percent of the national budget to education (the military, police, and firemen combined receive only 9.2 percent), and additional local funds for upgrading education cannot be expected. Instead, existing resources must be more effectively utilized.

The selection of El Salvador as the site for the OAS pilot ETV project has had a catalytic effect on the educational system. The prospect of providing quality education to all children of school age and of immediately bolstering education at the junior-secondary level has prompted greater concern for (1) curriculum revision suitable to the new technology of television, and (2) an evaluation of all existing school classrooms. A classroom study was carried out to determine which schools had classrooms adequately equipped for the reception of ETV programs.

El Salvador's ETV system is designed to be the model for Central America and perhaps for small underdeveloped countries worldwide. It is to be a three-channel system and will be fully operative by 1972. Its first target is for Plan Básico (junior-secondary) instruction. In 1971, a program of primary instruction will be integrated. There are to be substantial inputs not only of American equipment but of U.S. technical assistance. As many as 20 U.S. technical experts will participate. A Television Institute has been established apart from the Ministry of Education to direct the program's activities, with an operating budget of $206,000 for 1968.

Beginning in September 1968, new math and chemistry are to be broadcast to 50 classrooms, chosen from among some 100 communities, all of which have had no previous secondary schools. There appears to be considerable interest within these communities, and, in some instances, parents have offered to purchase the television sets. The production staff has completed production of the entire new math series, including the teachers' guides, and 100 teachers are now in training to staff the 50 schools. The staff has been using the facilities of the commercial station, Channel 2, but soon the new San Andrés center will be available for ETV use.

There is also work going on in radio education. Materials for adult education (mainly in literacy) are now being used on 10 radio stations. However, 2 stations are also transmitting a follow-up primary program with an accelerated three-year curriculum. Programs are being received in centers where there are special monitors. In 1967, 3,075 literacy students were examined and 1,902 passed. Many of them have gone on to study the first year of the accelerated primary program. There are some 300 students in the second year of the accelerated primary, and next year there will be a third-year group. The Ministry of Education would like to convert these educational radio programs into ETV, but such a move is not expected for at least five years.

The work of the Organization of Central American States (ODECA) has implications for possible use of television regionally. Since the key issue in regional ETV broadcasting is whether countries would be willing to share the educational content of such programs, ODECA's textbook program is encouraging development. This project began in 1962 and now includes all the Central American countries. Panama officially joined in 1968, but has been participating informally for five years. Mexico has also shown interest in the project. Eight million books have been printed and, with the recent phasing out of U.S. money from ROCAP, most Central American countries have provided funds to continue the program.

There has been an effort to define a common denominator in the field of curriculum without destroying national identity. Each country is represented on the writing team, and printing actually takes place within each country. Occasionally, individual countries have laws that call for mandatory inclusion of curriculum content not found in other countries' programs. Also, countries find that they must change words and expressions to conform to local language usage. Generally, however, the curriculum is the same in all countries. Even social studies is taught collectively. Except for a section of third-grade social studies entitled "My Country," the rest of third-grade social studies and all of social studies at the fourth grade level are common. Furthermore, ample margin is provided in the texts for the local teacher to include country-specific references. The combined ministries of education would like to see the textbook effort expanded and a Textbook Institute established to carry the program beyond the five basic subjects of primary school and into higher level curriculum.

It is hoped that when ETV reaches the primary level in 1971, the ETV personnel will draw from the ODECA textbooks for the content of the curriculum content of the programs.

El Salvador's ETV officials, including the Ministry of Education, would like El Salvador to become a center in ETV production for Central America. Representatives from other countries could come to El Salvador for training, and Salvadoran ETV specialists could go to other countries to help them develop comparable programs. However, officials consider the success of the ETV project at home as first priority. Subsequently, serious thought can be given to regional ETV efforts. Differences in school schedules and organization of curriculum presentation would have to be dealt with through joint planning.

PERSONS INTERVIEWED--MEXICO

Mario Lagúnez Guevara, ETV, National Polytechnical Institute, Zacatenco, Mexico City
Sta. López Guerra, ETV, National Polytechnical Institute, Zacatenco, Mexico City
Federico E. Lamicq, National Productivity Center
Manuel Bravo Jiménez, Bank of Mexico and National Productivity Center
Oscar Méndez Nápoles, Bank of Mexico
Blanca Jiménez Lozano, National Institute of Pedagogy
José Luis Nansen, National Institute of Pedagogy
Alvaro Galvez y Fuentes, Audiovisual Center, Ministry of Education
José Guadalupe Mainero, Audiovisual Center, Ministry of Education
Jorge Suárez Díaz, Ministry of Communications and Transportation
Felip Suárez Aguirre, Ministry of Education
Ricardo Espinosa, Monterrey Institute of Technology
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Albert Harkness, Jr., American Embassy
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FIELD TRIP NOTES--MEXICO

A remarkable expansion has taken place at all levels and in all areas of Mexico's educational system during the present decade. Preschool and primary enrollments totaled 5.1 million pupils in 1960; by 1967, this figure had risen to 8.2 million. Enrollment in intermediate institutions increased from 351,000 to 1.3 million over the same period, and similar gains were recorded in higher education.

To meet the great expansion in enrollments at public institutions, new teacher and professional posts have been created, increasing to 22,222 the number of such positions established in the past three years. During the same period, a far-reaching school construction program for elementary, secondary, and technical-vocational instruction has been undertaken.

As a consequence of these activities and of literacy programs, the illiteracy rate in that segment of the population six years of age and older was 26.2 percent in 1967, substantially lower than 1960, when the rate was 36.4 percent.

With this enormous boost in quantity, however, there has been a predictable lag in quality. For the most part, the preparation of teachers is less than adequate, and the classroom instruction continues to follow the traditional lines of teacher-talk and student-memorization. Furthermore, low status and low pay make teacher recruitment difficult, particularly in rural schools and remote areas.

A broadly based Presidential Commission has been at work for several years on a master plan for Mexico's education system. The Commission submitted its reports to the President in the spring of 1968. However, the report will not be made public until after a full Presidential review, and the SRI study team had no opportunity to review the contents of the master plan.

Top Ministry of Education officials do not plan to introduce television into regular classrooms in the near future. They believe that television is of low priority at a time when emphasis must be placed on teacher training and the building of more classrooms. Therefore, the Audiovisual Department of the Ministry of Education established its TV-secondary program to serve only those people who are not engaged in regular secondary studies.

Although tailored for television, the curriculum of telesecundaria is supposedly the same as that presented in the regular classes. Programs are produced in civic education, math, Spanish, biology, geography, English, universal history, art, technology, and physical education. USIS has provided film clips for about half of these subjects.

On January 2, 1968, the Audiovisual Department of the Ministry of Education began broadcasting from one of the commercial channels (5), using a repeater station in Las Lajas. Together, the two stations cover a pilot zone of the federal district and the seven states of Hidalgo, Mexico, Tlaxcala, Puebla, Veracruz, and part of Oaxaca. At present, only the first year of secondary school is transmitted. From among 600 applications, 300 model television centers were chosen. Of these, 75 are located in the federal district, and 225 are outside. Of the applications, 89 percent came from small population centers, (Mexico has more than 1,500 population centers with fewer than 100 inhabitants). Some local organization, usually a "patronato," is responsible for purchasing the television set and for finding or building a television classroom. An estimated 13,000 students follow courses in these 300 television classrooms. An unestimated number follow the courses in their homes. Those studying at home also enroll, on an individual-study basis, and receive credit if they pass the end-of-course examination.

The Audiovisual Department of the Ministry of Education has stated that successful completion of this course work provides the student with a credential comparable to the one received in regular secondary institutes. However, this statement is not fully accepted. Many educational spokesmen feel that ITV cannot be equivalent to conventional instruction, given certain basic shortcomings in the telesecundaria program. For one thing, the television monitors have been teaching at the fifth or sixth grade level, and although many of them have a normal school credential, about 20 percent have only a primary school diploma. They are given ETV training for only two months and then, except for one Saturday morning session per week, they perform independently. The teachers guidebooks are not designed to be an adequate substitute for the television program. Furthermore, the students who enroll have varied competence, depending on their background at the primary level and their age. Most students range from age 12 to 19, but there are also adults in attendance.

Television programs are also intended to supplement the curricula of regular secondary schools. Critics have challenged the assumption that ITV programs designed to bring core secondary school to areas where there is none can serve this dual purpose.

Criticism has perhaps been heightened because the Audiovisual Department has not yet shared with the general public the findings of an evaluation of ETV in Mexico. TV-fundamental courses have been offered for three years, and although the Department has promised to release an evaluation on the program, no such report has been issued. At this time, there is no consensus on the effectiveness of television in literacy training. The fundamental course takes four months to complete and is broadcast from

29 television stations. The same course is transmitted from 450 radio stations and lasts one month longer. The Department reports that 97 percent of the people who take the course become literate, but other sources suggest that this figure is much too high. No follow-up literacy program has been initiated. Aids or monitors to assist students taking the literacy series are trained centrally only when they volunteer. About 200 volunteer monitors have come to the Department for training. The monitors in the TV-secondary program receive $50 per month above their regular teaching salary.

The TV-fundamental programs are taped, but the Audiovisual Department does most of its telesecundaria productions live, because it believes that the teachers are better able to inspire students this way, and that teachers appear too sophisticated and stiff when taped. There are six pupils in the studio to generate a teacher-pupil atmosphere during the presentation. However, the first broadcasts were delayed for one month until the TV-teachers attained the self-assurance to go on the air live. Another reason given for producing programs live is the expense of video taping.

Closed-circuit television is now in operation in at least two institutes of higher education. The National Polytechnical Institute (IPN) in the federal district broadcasts six hours per day, to 10 classrooms with two sets in each room. Two hundred students watch in each classroom. The TV-teacher needs 10 rehearsal hours to produce 30 minutes of air time. Programs are video taped only occasionally because of the cost. Institute officials report that they have made several evaluations, with findings favorable to ETV, but are cautious to point out that such findings may be the result of the quality of the teacher.

IPN has offered a variety of subjects on television, including electrical engineering, petroleum engineering, basic electronics, fluid mechanics, English, chemistry, and mathematics review.

MIT (Monterrey Institute of Technology), under a 1963 Ford Foundation grant of $380,000 and with technical assistance from the University of Texas, has developed a closed-circuit ETV system. All programs are taped on a 2-inch Ampex Machine. The ETV people there believe that programs must be taped to take full advantage of the medium. They regard a live program as only a televised classroom (a view that is completely opposite from the one expressed by the Audiovisual Department of the Ministry of Education). Ten classrooms have television receivers, with two to four sets per room. On the average, 40 students view programs in each room. MIT has an auxiliary campus on the Gulf of California, in Guaymas, and video tapes are sent there to be broadcast on a closed-circuit basis. The present staffing of the video department at Monterrey includes the director, two full-time staff members to record and play video tapes, a secretary, a part-time assistant engineer, a full-time art illustrator, and several part-time students who operate cameras, audio, and lighting.

Some of the programs produced at MIT include Chemistry 1A (taken by 280 students at one time), Chemistry 1B (taken by 240), "How to Use the

Library," Psychology 1, and English. Chemistry 1A is the oldest course, having been used for four years. The taping of a new Chemistry 1A is planned for next year. Evaluation of the course was obtained both from students and teachers. On the positive side, students found televised chemistry to be: (1) an effective way to learn, because there are few distractions and greater necessity to pay attention to what is being taught; (2) more interesting than a regular course; and (3) well-prepared, with no interruptions, following a well-organized schedule. Negative student comments concerned: (1) the impossibility of perceiving colors and smells of substances; (2) too-rapid presentations; and (3) the inability to ask questions. There was the general opinion that the more experiments shown on television, the better the student's retention of the material covered.

The teachers felt that television was a satisfactory auxiliary in teaching, particularly in chemistry, since it is an experimental science that lends itself to visual aids. They felt that the televised chemistry program consolidated the course into a meaningful whole.

In addition to its programming and distribution of college courses, MIT has taped primary and secondary school programs that have been transmitted by open-circuit local television stations for the past three years. Sixty primary schools in the Monterrey area and a few within reception distance of the Chihuahua television station receive programs in world history, American geography, and natural science. Science programs are also broadcast at the secondary level, as is a community development program on nutrition and health. A tape on computers and their use is now being made.

The Ibero-American University, privately owned and operated, offers a five-year specialization in Sciences and Techniques of Information, which provides a general training in communications, including courses in radio, television, and cinematography. The University also has closed-circuit broadcasting to 56 classrooms, with 80 television sets.

The Mexican Government plans to complete the extension of its microwave network to cover 70 percent of the country, including Hermosillo, Mexicali, Tijuana, and Ensenada in the Northwest. Currently, only four of the 30 television station areas are linked, but plans call for a complete network by the time of the Olympic Games in October of 1968.

The Audiovisual Department of the Ministry of Education has ambitious plans of doubling current enrollment in the secondary program by the end of 1968. In 1969, the addition of a second year of secondary is planned, and by 1970 a third year will be added. Ten times as many television classrooms are also envisioned, as are plans for extension of the TV-fundamental programming.

The National Polytechnical Institute is planning on installing a 2500-MHz relay to the other part of the Institute campus by July of 1968, and thus will transmit closed-circuit courses in the two locations simultaneously. There are plans for expansion of facilities, but funds are lacking.

MIT is considering new programs in literacy, general industrial training (for viewing by local industrial employees at lunch time), and nutrition and health. The directors of the ETV program believe their biggest need is for an open-circuit transmitter to reach local public schools. An alternative would be for them to have either the money or the priority to use existing commercial channels.

The National Center for Education in Industrial Technology, a privately funded institute, will provide technical training in the formal educational setting, using four channels of closed-circuit television. The Center also will be producing materials for a new center to be opened in Guadalajara.

The National Productivity Center in Mexico is doing some experimental work on instructional materials that could be used to acquaint all students with the world of work. The idea is to illustrate simple concepts of productivity and of consumer economics. The developers have in mind the preparation of film strips and accompanying instructional materials. These materials may later be converted to instructional films. No decision has been made as to whether these materials will be used primarily in regular school classrooms or whether they will be made available through the network of training institutions run by the Productivity Center in 55 Mexican cities. The Ministry of Education is being kept informed about the pilot development of these materials. The Center is also preparing minute-long television shorts, or spots, on industrial safety and work simplification.

At present, the Center has no plans to use ITV in its training centers, based on the belief that skill training does not lend itself to the film or television media.

Mexican government officials have expressed interest in a regional center for training ETV personnel and in the possibilities of a satellite for Mexico.

PERSONS INTERVIEWED--NICARAGUA

Rodolfo A. Silva, TEVENIC
Octavio Sacasa S., Channel 2
Octavio Sacasa F., Channel 2
Raúl E. Quintanilla, Ministry of Education
Jaime Incern Barquero, Ministry of Education
Abraham Rocha Tercero, Ministry of Education
Mary Cocó Maltéz de Callejas, Ministry of Education

George Miller, American Embassy
Juan E. Silva, USAID

FIELD TRIP NOTES--NICARAGUA

According to the census of 1963, the average educational attainments of the population were 2.5 grades of schooling in urban areas and 1.6 grades in the rural sector. Literacy stood at 50 percent. An important educational reform, approved in 1967, established a single school calendar to replace the four distinct calendars that existed: the coffee-growing, cotton-growing, rainy season, and ordinary calendars. Teaching activities will be completely coordinated by 1969, so that the school year will run from mid-February to the end of November, with the months of greatest agricultural activity as a vacation period to avoid excessive absenteeism from school.

There are estimated to be between 25,000 and 30,000 television sets in use in Nicaragua. There are two stations in Managua--Television of Nicaragua (TEVENIC), which is 10 years old, and Channel 2,which is 2½ years old. Each station is operating on two channels with identical programming. Programs are scheduled from about 5 to 11 p.m. and consist mainly of American television fare and Mexican soap operas, and each produces about half an hour a day of live material. These stations are fairly well-equipped, although the equipment is modest. Channel 2 has two Dage orths, an 1100 Ampex, and a Phillips film chain. TEVENIC has comparable equipment.

Two years ago, TEVENIC offered to program a television literacy series developed by ABC, but the Ministry of Education did not respond to the offer. The station has since thought of putting television sets in schools for adult education, but has not acted, largely out of lack of personnel trained in ETV.

In radio, Radio Católica offers a literacy program, similar to the ones in Colombia and Honduras. The broadcasts are from 6:00 to 7:30 p.m., Monday through Friday. The program reaches 50 communities in six departments. All but seven of these communities are rural. An average class has from 35 to 50 students. Some attempt is made to train the monitors. Each community provides a radio, and each student pays 50 cents for course books supplied by the station.

In addition to instruction in literacy and math, there are half-hour discussions on community development, health, economics, and religion. The station also hopes to schedule a Saturday program in agriculture. The manuals, originally prepared by Radio Sutatenza in Colombia, are going to be rewritten shortly.

In the Office of Education Planning, there is interest in radio and television, especially for literacy and accelerated primary education for adults. Officials have turned to Venezuela for guidance in radio and now are observing El Salvador's progress in ETV. Nicaraguan educators are cooperating in the ODECA textbook program, and they have expressed interest in using El Salvador's TV-secondary programs for their own schools. However, use would be by topic rather than by grade, since their curriculum is not geared precisely to that of El Salvador. Internally, a new curriculum development will be initiated under an agreement with the Southwestern states' organization, SALA.

Top Ministry of Education officials would like to see El Salvador's project expanded to include all Central American countries.

PERSONS INTERVIEWED--PANAMA

Damon K. Kroh, USAID
Joseph Alsandro, Study Mission from Pennsylvania State University
Charles C. Briggs, USAID
W. B. Miller, American Embassy
Mr. Gillin, American Embassy

FIELD TRIP NOTES--PANAMA

According to the 1960 census, the literacy rate in Panama was 76.7 percent, about 10 percent lower than that of Costa Rica, but higher than that of Mexico and considerably higher than that of the other Central American countries. The average educational attainment level was 4.4 years of formal schooling, which is also a comparatively high figure. In 1965, the primary school enrollment numbered 203,429 pupils, representing 70 percent of all children between 5 and 14 years of age. Panama's educational progress is largely attributed to revenues furnished by the Panama Canal. A full 26 percent of the national budget is made available to education.

However, Panamanian educators feel the need for overall educational reform. Rural education is being strengthened by school construction. There is also a plan to broaden the base of primary school teacher training. The plan calls for the creation of teacher training institutes apart from the secondary schools and for the establishment of higher standards for teaching credentials.

There are two television networks in Panama. Microwave networks reach to nearly every part of the country. Each network has expressed its interest in providing its facilities for ETV; neither chain operates during the morning, and both would offer their facilities at the cost of operation.

Because of the elections of May 1968, the SRI study team did not visit with Panamanian officials. Interviews were conducted with AID personnel. They report that some thought is being given to the possibility of ETV. They believe that television could be most useful in teaching science and English, particularly in the 20 new consolidated secondary schools. The schools are currently buying PSSC chemistry films.

At the university level, it is thought that telecenters could greatly increase the reach of university courses to many smaller population areas throughout Panama. (There are 8,000 populated areas in the country, and almost three-fourths of these contain 50 persons or less.) The National University has six extension centers that try to provide local education, but the needs are far greater than the resources of these centers.

USIS test runs of ETV were well received in Panama, and AID personnel foresee the possibility of developing an ETV production center with

5½ hours per day of time for classroom instruction Monday through Friday and for teacher training on Saturday and Sunday. Thus, it would not be necessary to depend on commercial stations for production facilities, as is now the case.

Panama has recently joined both ODECA's primary textbook program and CUSUCA, the Central American University program, even though her position in the past has been one of relative isolation from the rest of Central America. These recent moves, plus her bid for the pilot television project that is being developed in El Salvador, suggest the country's growing interest in regional cooperation and in the use of broadcast media.

PERSONS INTERVIEWED--PERU

Rosa Dorca, Ministry of Education
Estella Barrendarien de Garland, Ministry of Education
Miss Cánal, TEPA, Arequipa
Carlos Malpica, National Institute of Planning
Oscar Gómez P., JAN
Jorge A. Kawano K., National Telecommunications Council (JPNT)
A. A. Giesecke, National Institute of Geophysics and JPNT
Percy Carenjo, JPNT

James F. Smith, USAID
Ralph Fields, Teachers College of Columbia University Study Mission
John Baum, Teachers College of Columbia University Study Mission
Edward Medina, Teachers College of Columbia University Study Mission
Richard Scott, Peace Corps Volunteer
Ray Garrison, Consultant to SENATI
Darrell Carter, USIS, American Embassy
Joseph Michenfelder, Maryknoll Fathers

FIELD TRIP NOTES--PERU

Starting from a relatively low base of enrollment ratios and average educational attainment, Peru has placed major emphasis on education during recent years. However, serious problems persist, including high illiteracy rates among populations in the altiplano, an over supply of primary teachers, a maldistribution of enrollment in relation to manpower needs, and insufficient classroom capacity, particularly in the rapidly growing barriadas in the major cities. Low retention rates characteristic of most of Latin America are a particular problem in primary education. The educational system is generally geared to rote learning, and content of the curriculum is not development-oriented.

A sizeable portion of the population is non-Spanish speaking (Quechua and Aymara are the major tongues, but there are a number of others in the jungle area), and this further complicates the large educational task to be accomplished. Some pilot experiments with bilingual schools appear to be yielding promising results.

Peru's current economic recession prevents funding of major educational reforms and construction. The central planning office has set targets to: (1) increase the workloads of teachers to bring them up to practices in neighboring countries; (2) adopt educational technology, perhaps ETV; (3) consolidate teacher training from 79 institutes to 14 regional centers; (4) develop improved instructional materials; (5) increase universal education to nine years; and (6) evolve a long range master plan for education.

Commercial television is well-established in Peru. The stations in Lima are well equipped, operate full schedules, and seem highly professional. In the smaller cities, installations tend to be quite primitive. There are two wholly-ETV stations in Lima, one operated by INTE at the Ministry of Education and one by the University of Lima.

The University station, which operates in cramped studios with antique image orthicons and a primitive switching system, has a signal adequate to reach the entire city of Lima. The station concentrates on general cultural and intellectual programming for the most part, although there is substantial planning toward working in the vocational and home economic areas. The Ministry education station operates with vidicon equipment, from minimal studios on the 21st floor of the Ministry Building. The Phillips Company has provided the station with a new transmitter and new cameras. Production standards appear low. Programming has addressed itself to a primary level of education, not to primary education within regular schools, but rather as an auxiliary service for children unable to attend school. Within the last year or so, a limited number of schools in Lima have received the Ministry's television programs on a pilot basis.

Other existing ETV efforts take place at commercial stations. That in Arequipa appears to have high morale, good leadership, and an adequate level of production.* The key program has been teleprimaria for primary-age children not in school, largely because of a classroom shortage. The Ministry of Education took over financing and control of televised education in 1964, and ETV time is now six hours per day. In addition to the TV-primary school program, there has been work at the preschool level in recreational material and literacy programs for workers in factories and for adults attending telecenters. Sets have been donated or were bought on long term credit.

Television operations were started in Puno by the Maryknoll fathers in 1966. "TelePuno" has been assisted by the local Bishop, and it now looks as if the Bishop will buy the Puno television station from the commercial company. The program currently has 17 sets located in public schools. Programs have been limited to films sent from Lima (usually from CBS) and to tapes of student spelling contests. Also, the preliminary details of TV-teacher training courses on new math and physics are being worked out.

Ambitious plans call for setting up one telecenter in each of the 98 districts in Puno. Sets are to be provided by TelePuno, if the people build a community center, buy a generator, and a retransmitter where the signal is weak. The directors propose to produce eight categories of presentations in the Spanish, Aymara, and Quechua languages:
(1) preschool--entertainment and education; (2) fundamental--practical demonstrations for campesinos; (3) primary school--complementary;
(4) secondary school--awakening interest, with vocational emphasis;
(5) normal school--modern methods and further education for teachers;
(6) university--to make higher education available for all; (7) cultural--education to broaden the viewer's outlook; and (8) moral--expression of hopes and desires.

There is also interest and activity in ETV at Piura, Chiclayo, Trujillo, Chimbote, Ica, Cuzco, and Huancayo.

In radio education, there is activity at Canete, Indiana, Puerto Maldenato, Jaén, and Tacna, with joint radio and television operations at Lima, Arequipa, and, most recently, Puno. In 1969, radio and television in Puno are to be formally integrated under a Center for Social Communications.

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* See Wilbur J. Schramm, New Educational Media in Action: Case Studies for Planners, UNESCO and International Institute for Educational Planning (Paris, France, 1967).

Although past efforts in educational radio and television have tended to be small and unrelated, officials are increasingly aware that coordination among programs will be necessary if significant progress is to be made in the widespread use of educational radio and television.

There is such an effort currently being made by INTE (Instituto Nacional de Teleducación) supported by the Instituto Peruano de Fomento Educativo. This project, which is very recent and has not yet been assessed by an objective agency, calls for a capital expenditure over three years of $5,622,000 (U.S.) and an annual expenditure of $3,500,000 (U.S.).

The total Ministry of Education expenditure (1960-1967) on ETV has been $21,647,000 (soles). Educational levels with which programming has attempted to deal are:

- Supplementary education (kindergarten)
- Auxiliary education (fourth and fifth grades)
- Complementary education (fourth and fifth grades)
- Extension television (children and teenagers)
- Literacy, agriculture, and other fundamental education for adults

Radio education has concerned itself chiefly with rural communal development and urban communal development.

PERSONS INTERVIEWED--URUGUAY

Representative of Dr. Schiaffarino, Ministry of Education

Charles Thomas, Peace Corps Volunteer
Frank Stewart, USAID
Margaret Knight, USAID
Gerold Waters, USIS
Arther V. Diggle, USIS
Nathan Rosenfeld, American Embassy

FIELD TRIP NOTES--URUGUAY

Uruguay ranks high among Latin American countries, according to most educational indicators. As of 1963, the rate of illiteracy was less than 10 percent, and 42 percent of the population had completed at least six years of schooling. The extensive development of primary education has restricted illiteracy to older age groups. Less than 4 percent of the population between 15 and 35 years of age were illiterate in 1963.

However, the dropout and repeater rates are of concern to education officials. For instance, 40 percent of students enrolled in the primary program fail to complete it, and in 1963 a quarter of all primary students had to repeat the year.

One reform measure under the National Economic and Social Development Plan (1965-1974) seeks to broaden the secondary school program, beginning with a compulsory comprehensive program for seventh, eighth, and ninth grades, but allowing students who will not continue to the University to enter a one-year terminal program in technical and mechanical training.

ETV is soon to assist in combatting the high dropout and repeater rates at the primary level. With the support of AID and the Peace Corps, primary school instruction will be broadcast to classrooms by March 1969. The program will reach 40 primary schools initially, with one unit of ITV 20 to 25 minutes per day. Expansion will occur gradually, as greater expertise is acquired.

An ETV production center is now being constructed. AID may provide equipment in addition to the current technical aid, but this is delayed at the present. The production staff includes 35 people: a director, a producer, a curriculum specialist, a program director, eight TV-teachers, a cameraman, a cinematographer, a director of telecine, a tape engineer, a sound engineer, a technician, an artist, a distribution expert, and a public relations man. The director of the program has been to Anaheim, California, Hagerstown, Maryland, and other closed-circuit installations in the United States. There are eight Peace Corps Volunteers with some expertise in ETV who may take part in the project, but their role is still uncertain.

For the past year and a half the primary school production staff has broadcast general educational programs to the homes (mostly lectures) on a half-hour basis each morning. Channel 4 has been donating its facilities and broadcast time. A separate production crew has been offering secondary-level programs, consisting mainly of foreign films from EBF and other sources.

PERSONS INTERVIEWED--VENEZUELA

Miguel Pinto Salvatierra, EDUPLAN
Juan Torres, Audiovisual Center, Ministry of Education
Luis Delgado, Audiovisual Center, Ministry of Education
Reyes Zerpa, Audiovisual Center, Ministry of Education
Juvenal Utrera Velásquez, INCE
Jesus A. Sanabria S., INCE
John de Abati, University of the Oriente
Mario Spitaleri, University of the Oriente

Eldon Y. Stewart, USAID
Bruce A. Pesear, USAID
Ronald Oppen, USIS
George Hull, Creole Foundation
Clyde Kelsey, Ford Foundation

FIELD TRIP NOTES--VENEZUELA

The Venezuelan educational system began active expansion in 1950, and there has been noticeable progress since that time. The rate of illiteracy, for example, was reduced from 47 percent in 1950 to 24 percent in 1967. However, there is still a need to enroll more school-age children and to retain those who register. The dropout rate is 71 percent at the primary level and over 90 percent at the secondary level.

The Office of Educational Planning, EDUPLAN, is seeking to reform education at all levels, including both teaching methods and content of curriculum. A textbook project, fashioned after ODECA's program, is being conducted under the auspices of the OAS. The countries included in the project are Venezuela, Colombia, and Ecuador. The Venezuelan government has already set aside $12 million bolivares of the 1969 budget for the writing of these textbooks. Officials believe that Latin countries with similar educational levels are needlessly duplicating each others' efforts in at least 50 percent of the subject matter. The textbook program is considered to be one attempt to remedy this problem of educational wastage.

The Audiovisual Center of the Ministry of Education produces ETV programs and National Television provides studio facilities and two channels (Channels 2 and 4). The National Television network broadcasts from Caracas to many of the population centers of the country, including Maracay, Valencia, Coro, Maracaibo, Barquisimeto, and Carora. Under Venezuelan law, 15 percent of the television time on commercial stations is reserved for government use, but the decision as to which 15 percent is left to the discretion of the station. This arrangement has limited ETV programming. For example, televised adult literacy classes were begun in 1961, but were discontinued in 1962 because of lack of viewers. This failure was largely attributed to the programming time, 10:30 to 11:30 at night, which was the earliest evening time that commercial television was willing to release.

However, programming for kindergarten, fourth grade, and sixth grade has proved successful. National Television reserves 9:00 to 10:30 a.m. for this purpose. The programs for kindergarten were started on a pilot basis in 1959. Fourth grade and sixth grade programs were added several years later. These programs offer supplementary material to enrich the learning experience at what are considered to be important educational levels: kindergarten, because attitudes towards formal education are just being formed; fourth grade, because this used to be the last year of primary school and still has a workload meant for terminal students; and sixth grade, because this is now the last year of primary school. It is hoped that these courses will help to decrease the dropout rate. The programs reach almost all the primary schools in Caracas (some 250), as well as seven or eight other population centers in the country.

ETV courses at the secondary level were attempted in physics, chemistry, and English, but coordination of programs proved too difficult to arrange because school course schedules varied so greatly.

During the summer, the Audiovisual Center offers remedial courses for secondary students in math, Spanish, and English. Also, for two weeks before the academic year begins, a teacher orientation course is televised. During the regular year, there are weekly broadcasts to provide inservice training. Teachers also meet in groups with their local supervisors and are asked to fill out an evaluation card each month.

There are 47 regular staff members at the Audiovisual Center, including one director of television, two program directors, two coordinators, three teachers, one relief teacher, one film editor, and one secretary for the television project. The Center is planning to put into operation its own television studio, and space has already been reserved. Plans also call for microwave equipment, so that the center will be able to transmit its programs to the commercial stations.

At present, all programs are live. However, two video tape recorders are in the budget for 1969. ETV personnel feel that one of the best ways of improving programming is through video tape, because it permits editing. There is a great reliance on films in programming. Some of them are made at the Audiovisual Center. In fact, the Center is known for its film strips, which have won both national and international prizes.

National Radio works in coordination with National Television and devotes five hours per day to educational broadcasts. Most of these program hours are devoted to literacy classes. But, as in the case of television, the radio programs are intended to provide supplementary information to help maintain the interest of the students in their studies, rather than as the major source of instruction. The Office of Adult Education furnishes much of the educational content.

The National Institute for Educational Cooperation, INCE, provides inservice training to upgrade the work force and preservice training for school dropouts. In 1967, 90,000 individuals were trained. Currently, INCE's use of media is limited to one weekly half-hour program over National Radio. This broadcast is devoted to answering questions that workmen have sent in. INCE officials believe that while television would not be effective in teaching skills because of the need for repetition, it could be used both in relating theory to practice and in disseminating new technical information rapidly.

At the level of higher education, the University of the Oriente is initiating extensive use of communication media. A building has already been constructed that will house an ETV production studio. Video taped programs of fundamental college science and math will be transmitted through closed circuit at the School for General Studies in Cumaná. Plans also call for the distribution of these tapes to the Schools of Medicine, Engineering, and Agriculture, all on separate campuses. On the production staff there are two faculty members in communications, a photographer, two draftsmen, two director-producers, two cameramen, several electrical engineers and technicians, two secretaries, and eight part-time assistants. There are also 32 people with Ph.D.'s who will help design the courses. In addition to the television equipment that is already owned, the University budget provides $1,000 for hardware.

Once this program is underway, plans call for the establishment of a School of Communications. From a recent poll of 1,170 beginning students at the University, it was found that one-third reported communications to be their preferred for a major. In a further breakdown, most interest centered around technological aspects of radio and television.

Venezuelan officials express interest in the use of a satellite for ETV. However, subregional use is preferred--one satellite for Mexico and Central America, a second for the upper cone of South America, and a third for the lower cone of South America--because of the differences in educational development. Venezuelans and Colombians have already discussed the possibilities of regional sharing of programs. Personnel at Venezuela's Audiovisual Center consider both Colombia and Venezuela to be the leaders in Latin America in systematic development of ETV and believe that these two countries should share their knowledge. Venezuela has already shown willingness to cooperate multinationally. INCE, for example, has had several multinational conferences and courses that have been attended by Latins from Argentina to the Dominican Republic. And the Office of Adult Education has helped to set up adult education programs and train personnel in several Latin countries.

Officials mentioned two high priority uses for satellite broadcasts: (1) the broadcasting of public information to extend the educational base of the masses, and (2) the broadcasting of more specialized information, such as recent technological discoveries in the United States.

Venezuela has good resources in radio and television, plus a willingness to cooperate with other countries in the use of new technologies. Officials caution, however, that if satellites are to be called into use, expenditures should be made soon, before so much is spent on local microwave and other systems that country budgets cannot afford the expense of a satellites system.

Appendix C

THE EMERGING INTER-AMERICAN COMMUNITY AND SATELLITE-DISTRIBUTED EDUCATIONAL TELEVISION

by Paul R. Hanna and Janet F. Abrams

Satellite communication technology is here to stay. Man will use it because it exists. And education is one of the enterprises to which the new technology will be harnessed. However, one may seriously ask what educational purposes will be served by this fantastically effective invention. Are those responsible for preparing the message that is to be transmitted over the satellite network able and willing to be as future-oriented as the scientists and engineers who will provide the hardware? Will the content of information, values, and skills be the same old curricular refrain, or will men be wise enough and courageous enough to use the new communication breakthrough to prepare curriculum content and methods to produce the competent and motivated human resources needed to reform society? To survive, we must lessen the rapidly widening lag or gap between science and technology on the one hand and the human values and social condition of man on the other. Education seems to be the chosen instrument for bringing world culture once again into a dynamic balance.

The President of the United States recently traveled to the city of San Salvador to meet with the presidents of the five nations that have formed the Central American Common Market: El Salvador, Costa Rica, Guatemala, Honduras, and Nicaragua. While there, he pledged $65 million in U.S. loans, $30 million of which is to go to the Central American Banks for Economic Integration to improve multinational transportation and telecommunications. These heads of Central American nations reaffirmed their determination to integrate the economic and social mechanisms that could help meet the common concerns for adequate food, clothing, shelter, freedom from disease and ignorance, and hope for better conditions of mankind.

President Johnson, in his address, spoke warmly of the promise of satellite-based educational television that one day could teach millions of Central American citizens how to achieve better lives. He pointed to the power of this new creative media as "mankind's best hope for peace" and said that, with the enlightenment that could be distributed from the satellite in the heavens, "each of the developing nations (worldwide) can look to Central America for proof that neighbors can live in peace." He asserted the belief that these nations can, by joining together, advance the common welfare of their people, "and that they can do all this without weakening national cultures or losing national identities."

All of this sounds exciting and hopeful of a better tomorrow. But will the educational content and method to be channeled via a satellite make any real contribution to the realization of these possibilities? That is the basic question to be faced.

Education in the Service of Multinational Community Development

During the past decade, much attention has been focused on investment in education to provide human capital needed in the modernization and development of that community we call "the nation." In many of the smaller and less developed nations, recent historic forces of partitioning and splintering have carved up space, resources, and peoples into politics that are not viable. Further, modern science and technology increasingly undermine the concept of a sovereign and self-contained national community as the ultimate in the organization of human society. Perhaps we are entering a new chapter in history as significant as former periods of stress and innovation, when tribes were generated out of previously self-sufficient families, or when nations were formed out of previously autonomous city states. We may be witnesses to a shift from emphasis on nation-building (our goal for the past several hundred years) to the emerging multinational communities that are the outgrowth of mounting inabilities of the older and lesser national communities to function satisfactorily in meeting human needs.

The idea of multinational communities is certainly not new. Nation states have had a long history of joining others of like scale for defense, aggression, or a variety of other reasons. However, until very recent times, the focus has been on the nation, with secondary concern on the larger-than-national community. The crest of the wave of nationalism may have already passed over us, and histories of the future may refer to this century as the time of multinational community development. Although this century may be recorded as witnessing attempts at building a world community the odds appear strongly against uniting over 150 separate nations in a one-world association of nations in the near future. There is more likely to be an intermediate step of forming several regional associations of nations, for example, the Central American Common Market; the Latin America Free Trade Association (LAFTA); the Andean Development Corporation; the Organization of American States. Eventually, out of the experiences of creating and maintaining such regional multinational communities, we may be ready for and capable of the ultimate formation of all-inclusive family of nations.

If one agrees even partially with such reasoning, then one naturally asks whether an investment in education to prepare the minds and spirits of people for such multinational development is an essential condition for forming viable regional economic, social, intellectual, and political communities. And if the answer is in the affirmative, one asks a related question: what is now being done to facilitate the human resource development consonant with these objectives? Unfortunately the present-day answer to this question has been "very little."

The logical conclusion would appear to be an increase in concern, study, and planning for a share of the investment in education to go toward creating understanding and values essential to multinational community development. No one would propose the abandonment of education for nation-building. The nation as a community is an essential unit in the set of interdependent and expanding communities that starts with the family and end with the world community of nations. But it is reasonable to suggest that we should add another dimension,to our educational effort--the development of several multinational communities.

We can now return to the problem of the educational purposes to be served by satellite communication and ETV. If multinational communities are an important goal for the future, and if some sharing of understandings and values is necessary for such cooperation, then the answer is clear. Satellite communication and ETV provide a dramatic means of transmitting a multinational message to all Latin nations.

What would this message be? In the first place, it could focus on the heritage that all Latin Americans share. Knowledge of this history could promote understanding of the forces that have shaped the similarities and differences of the peoples and nations of the continent. Secondly, the new media could call attention to the vast networks of associations and activities in the public and private sectors of the American states that are working toward multinational cooperation. Much has been accomplished and many problems still exist, but only knowledge and understanding of the situation will allow cooperation to continue and flourish.

Let us now consider some of the themes that could serve as subjects for Pan-American programs on television. We will first consider historical inter-American commonality, and then turn to modern-day inter-American strivings.

Historical Inter-American Commonality

The Indians as a Theme

The story of the earliest inhabitants of Latin America, the Indians, provides a beginning for promoting understanding of the common ties that bind the peoples of the Americas today. Not only do vestiges of those early and highly developed civilizations still remain, but the Indians knew no national boundaries and were spread over areas that today comprise several nations.

The American Indians are thought to be descendants of immigrants from Asia. These Indian groups lost contact with one another as they dispersed across the continent. Dialects and a multiplicity of cultures developed over the generations. But the general physical appearance did not greatly change: dark eyes, straight black hair, brownish-yellowish skin. These characteristics are retained even today by the Indian of the Americas and are apparent in the mestizos.

Middle America became populated by descendants of the Asian migrants who developed the Maya and Aztec civilizations. The Maya were pre-eminent in arts, crafts, and mathematics. Their sculpture was sophisticated and their hieroglyphs and calendar elaborate. Almost everything the Maya did and believed related to the maizefields. The Indian farmer today observes the same cycles and planting and cultivation methods; and he still speaks the ancient language. The Aztecs, while never attaining the refinement and splendor of the Maya, surpassed them in social organization. The culture supported communal ownership of land, and men were honored according to the degree to which they served the community.

The great Inca civilization developed on the west coast of South America, their authority extending through Peru, across Bolivia, to the borders of modern Argentina, far into Chile, and over Ecuador. The Incas maintained a highly efficient organization of a territory whose natural features today still render it particularly unsuited to political unification. Land was held by the emperor in trust for the people, and a hierarchy of officials supervised. As the empire expanded, inhabitants of newly conquered regions were transferred nearer to the center, their former homelands being resettled with people who were already "conditioned" to the Inca way of life. The Incas thus integrated their people into a social whole over an area that today is made up of several nations.

The European Colonial Heritage as a Theme

Another common aspect of Latin American history is the 300 years of European rule. The Spaniards and Portuguese established their own governmental structures and greatly influenced the culture. These effects were similar all over Latin America and serve as a bond uniting the peoples of the continent. Much of this heritage is alive today.

The first explorers in the New World heard stories from the Indians about fabulous treasure, and the New World thus became a world to be plundered as well as explored. By 1550, the conquistadores had completed the conquest. All of them set up cities that today are still the major centers of population. They could not conceive of a civilization that was not built around cities, so their actions in the 16th century fixed the urban pattern of Spanish and Portuguese America. The Spaniards depended on the Indians to work for them in exploiting the riches of the conquered lands, and they desired Indian women. Thus the mestizo, or mixed-blood, was born.

The conquered territories and peoples were regarded as additional kingdoms of the Spanish empire. The authority of the King of Spain was supreme and wishes were transmitted to the American kingdoms by the Council of the Indies, a powerful body whose functions included issuing laws, supervising the Church, justice and finance, and directing trade and shipping. Even small details of everyday life received attention. The senior functionaries were viceroys and each controlled a large area, foreshadowing the break-up of the continent into separate states after the revolutionary movements.

The Church, in the early period of colonial organization, sent many personnel to operate side by side with the secular administrations. Indians were baptized by the thousands, and Christianity became the religion of the New World. The spreading of Spanish culture in the Americas was also the churchmen's achievement. Having known the glories of Spain's golden age, they taught the Indians to imitate its cathedrals, carvings, and religious paintings. In 1551, Charles V granted assent for the founding of two great universities of Mexico and Lima. University education was generally dominated by the Church until the end of the 18th century.

The Independence Struggle as a Theme

Although the wars against Spain and the struggle for independence split Latin America into separate nations, all were the product of similar circumstances and are therefore a common element in the continent's history. The original objective of the wars was not independence but opposition to Napoleon, who usurped the Spanish throne in 1808. But the North American Revolution of the 13 colonies against England had set an example of how people in the New World could attain independence. Further, the French Revolution had encouraged men to think of liberty and the doctrines of the 18th-century European enlightenment. The hostility of the criollos to the peninsulares and the corrupt character of the Spanish government increased the pressure.

The Spanish American insurrections and wars of liberation did not prepare the way for unity, as in the United States of America, but produced seventeen separate republics. However, the geographical obstacles are formidable, and no communication or transportation mechanisms similar to those in the United States had been built to link regions together. Furthermore, Spanish America contained a great variety of widely contrasting social elements. It was already an old and complex society, composed of locally-born criollos, who had inherited the pride of their Spanish ancestors but had acquired something of an American spirit; mestizos, who were partly European, partly Indian, and really belonged to neither race; and Indians, who either labored as serfs for the criollos and mestizos or lived in isolation in valleys and plateaus among the mountains.

Despite the failure of the newly independent Latin American nations to join in unity, the call for integration is an old one. Simon Bolívar was the first and foremost exponent of Latin American unity. In 1819, he first announced his scheme for combining Venezuela, New Granada, and the still-unconquered Ecuador in a state to be called Gran Colombia. "I desire," he said, "more than anything else, to see the greatest nation of the world formed in America, great not so much for its extension and richness as for its liberty and glory." Although he later wrote that "America is ungovernable," he did not give up his dream that the American republics should join together in a league of nations. In June 1826, he convened the Congress of Panama, which he hoped would "act as a Council in great conflicts, to be appealed to in case of common danger, and be a faithful interpreter of public treaties, when difficulties should arise, and conciliate, in short, all our differences." If his plan were to succeed, Bolivar asked, "What, then, shall be the Isthmus of Corinth compared with that of Panama?" Although the conference did not succeed, it did give expression to the ideals of cooperation and conciliation that were to be the inspiration of the Inter-American system of today.

The Common Heritage and The Use of ETV

To focus on the proposed educational satellite (or other means of sharing ETV), one potentially strong way of building a multinational inter-American community could be through televising from north to south and from the Atlantic to the Pacific the fascinating story of the common heritage of the Latin American peoples: an underlying Indian civilization, a 300-year overlay of European colonial civilization, and more than 100 years of struggle for independence from European domination. This is an exciting story and one that all Latin Americans share. If dramatized in Pan-American television programs, it would undoubtedly have a powerful unifying effect on the peoples of this hemisphere.

In the present period, too, there are powerful forces emerging to draw the isolated republics closer together in cooperative endeavors. There is a story to be told and dramatized over hemisphere-wide television about the purpose, work, promise, and problems of these forces that will make the inhabitant of the Americas proud of the beginnings of integration. The story can help him realize what greater strides could follow if the people got behind such multinational efforts with vigor and determination to make the conditions of life better for all.

We will now review some of the emerging strands that already could bind the Americas into an integrated system. Problems and failures, as well as successes, are mentioned, because only an understanding of these difficulties will allow them to be resolved.

The Inter-American System

Organization of American States (OAS)

The OAS, the world's oldest operating international organization, unites more than 20 republics of the western hemisphere for the following purposes:

- Peace and collective security
- Pacific settlement of disputes
- Solution of political, juridicial, and economic problems
- Promotion of economic, social, and cultural development

The OAS can trace its history back to the Congress of Panama, convoked in 1826 by Simon Bolívar for collective security, arbitration, and conciliation. In 1890, at the First International Conference of American States, the International Union of American Republics was established. Its objectives were the peaceful arbitration of disputes and the collection and distribution of commercial information by the Commercial Bureau. In 1910, the Commercial Bureau, having been assigned new functions, was given the name Pan American Union. As its activities increased, it came to be regarded as the parent union itself. It now serves as the Secretariat of the OAS.

In 1948, at the Ninth International Conference of American States at Bogotá, Colombia, the OAS was formally established, integrating into concrete form the principles, purposes, and policies that have been in the making since 1890.

For its first half-century, the inter-American system had concentrated on mechanisms for safeguarding hemispheric peace and for preventing foreign intervention. But at a meeting of the Presidents of the American Republics in 1956 came the first recognition of the internal enemy--the economic and social ills that plagued Latin America. The principles developed at this meeting became the foundation of the Alliance for Progress.

Alliance for Progress

The Alliance was established by the Charter of Punta del Este on August 17, 1961. Its stated purpose is to enlist the full energies of the peoples of the American republics in a great cooperative effort to accelerate economic and social development in Latin America. Its goals are of two types:

1. Those directly affecting the daily lives of 135 million Latin Americans who are ill-housed, ill-clothed, ill-fed and illiterate.

2. Those long term goals of socio-economic reform and development to raise standards of living in each nation through national development programs, multinational regional economic integration, maintenance of stable price levels for exports, rate of economic growth not less than 2.5 percent per capita per year, elimination of adult illiteracy, and construction of vast new health, housing, and educational facilities.

The Alliance is a voluntary partnership of all the Latin American republics (except Cuba) and the United States; Canada may join soon. Three international organizations share responsibility for directing and executing the programs of the Alliance. The OAS conducts basic studies, provides technicians and task forces, and maintains a committee of nine experts who evaluate long term development plans. This group is referred to as the Inter-American Committee on the Alliance for Progress (CIAP). The Inter-American Development Bank (IDB) channels funds into the respective countries. The United Nations Economics Commission for Latin America (ECLA) provides specialists to direct new economic development projects.

Financial support for the Alliance comes from:

- Funds appropriated by Latin American governments and the United States
- Loans from international agencies such as IDB and the World Bank
- Loans and investments by foreign governments and private investors.

The goals of the Alliance were to be accomplished in one decade, but it has become apparent that the task is far more difficult than was foreseen in 1961. Official recognition of this fact came in February 1967, when the OAS incorporated the objectives of the Alliance into its charter.

The first five years of the Alliance showed moderate success. Social reforms of land, education, housing, and technical and administrative reforms of banking, taxation, investment, and public administration have been set in motion in almost every nation. Tariff and other trade barriers among members have been progressively lowered, the machinery built for multinational coordination and cooperation, businesses and governments prepared for regional market planning, and the acceptance of the integration concept spread to every nation in the hemisphere.

However, the Alliance has not been able to provide the impetus for any dramatic developmental surge that could be translated into terms of social or economic improvements. Despite very real effort in this decade, the per-capita measurement of progress has been stunted by the rate of population increase (2.9 percent a year) overtaking the per-capita GNP economic growth and crippled by political upheaval, lagging rates of investment, mounting foreign debt, and worsening terms of trade. Latin America continues to get an ever-shrinking share of the world wealth.

Punta del Este Conference, April 1967

The Punta del Este Conference was a meeting of the leaders of all of the hemisphere's soverign nations except Canada, Cuba, Barbados, Jamaica, Guayana, and Bolivia. The result was an "action program" for Latin American advancement that was designed to cope with the problems that the Alliance for Progress had not been able to solve.

The principal goals of the program are:

- Beginning of a Latin American common market group and substantial operation by 1985

- Promotion of development projects concerning more than one Latin American nation
- Improvement of conditions for Latin American exports
- Modernization of agricultural production
- Additional educational and health care institutions
- Elimination of unnecessary military expenditures

Evaluation of the goals of the program after one year shows little progress. Food production is losing to population growth, the level of exports is but half of the minimum required for desirable development, several countries (notably Brazil) severely neglect education, and multinational development projects have not really materialized. The Common Market has run into problems in implementation since it affects national industries and national aspirations. It was to be an amalgam of the Latin American Free Trade Association and the Central American Common Market, both of which have experienced difficulties (to be discussed in later sections). Some moderation on military expenditures from the United States has been accomplished, but several nations are buying arms from Europe.

One area in which progress has been noted, however, is in the domain of ETV. The ongoing junior-secondary pilot program in El Salvador is a direct outgrowth of this conference. Hopefully, this project will serve as a model for all Latin America. Another proposal at the conference, concerning the establishment of a multinational ETV training center, has yet to come to fruition, although some five or six countries have submitted proposals for OAS review and decision-making. Perhaps the prospect of multinational programming emanating from such a center could hasten its establishment.

So far, we have been sketching the little-known but extensive network comprising the inter-American system. We believe that these achievements need much wider understanding among the peoples of the inter-American community and that a program of hemisphere-wide ETV could contribute immeasurably to such enlightenment and support. We now turn to another network of the emerging inter-American community--economic integration.

Economic Integration

Latin American Free Trade Association (LAFTA)

LAFTA was established by the Treaty of Montevideo in 1961, with the goal of a free trade area for South America by 1973. Its members include Mexico and all the South American nations except Guayana (Venezuela and Bolivia joined in 1966).

The terms of LAFTA provide for a progressive reduction of intra-participant tariffs and other trade barriers, so that at the end of 12 years these will have been reduced to zero. Towards this goal, inter-regional exports by 1964 were valued at 80 percent more than 1961, while total exports rose only 20 percent. The value of these exports increased from 6.1 percent to 9.4 percent of total trade, and the products covered by tariff negotiations increased. In addition, the central banks of the member nations agreed on the basic provisions for a voluntary, multilateral clearinghouse mechanism.

However, there have been major stumbling blocks in LAFTA tariff reductions. The middle- and smaller-sized nations are afraid of being swamped by the manufactured and agricultural output of the Big Three--Argentina, Brazil and Mexico. Special subdivisions of member states have had to be set up, with compensations going to Colombia, Chile, Peru, Uruguay, and Venezuela as "markets of insufficient size" and still greater compensations going to Bolivia, Ecuador, and Paraguay as "relatively less developed states." Indicative of these problems was a meeting in late 1967 where the small nations blocked any advance toward tariff reductions.

These problems result from the nature of the economies of the LAFTA nations. They are essentially competitive, not complementary, in their exports. The principal exports are either agricultural or extractive and are marketed largely outside Latin America. The nations are essentially self-sufficient in agricultural production, which suggests that any major increase in trade among themselves will likely have to be in some new products. In addition, a great deal of trade is with nations outside the area. Trade and capital flow toward Europe and the United States, and land transportation, ocean shipping, air travel, and financial avenues all flow in these same directions.

Central American Common Market (CACM)

CACM is a free trade association among Nicaragua, Costa Rica, El Salvador, Guatemala, and Honduras. It was created in 1960, with the goal of a common market by 1966.

CACM has made remarkable advances in its first few years. Elimination of tariff barriers has led to a dramatic increase in intraregional trade, rapid development of industry, and a sizeable inflow of foreign investment. Intra-Central American trade has increased from $8 million per year to $140 million. Regional integration is also largely responsible for Central America's 6 percent average yearly economic growth rate since CACM was formed. However, CACM has also had problems with balance of payments difficulties, and development programs are slowing down. Industrial integration has been hampered by the interests of individual member nations.

The prospects for CACM's success are considerably greater than for LAFTA. The member nations are small, which means that many industries can be successfully developed for the whole CACM area. In such industries, economies of scale may not be great, but they may be realizable at relatively small levels of output. The nations are contiguous and now are linked by the Pan American Highway. Also, it is more difficult for Central American states to remain economically self-sufficient when artificial barriers are reduced. In addition, the agreement is much wider in scope and in vision. A common bank, Central American Bank for Economic Integration (CABEI), has been established; a clearing house exists; ministers meet regularly with their counterparts to deal with the concrete problems of integration. The last meeting met in July 1968 and added $65 million loan funds from the United States of America to foster integration among the five member nations.

The relative success of the Central American countries in multinational cooperation suggests that their activities may provide a good source for initial multinational programming. Transmission could be limited to the Central American region or could be shared with the hemisphere as a whole. Production of such programs could be done at the new ETV center, San Andrés, in El Salvador.

Andean Bloc

The Andean Bloc, composed of Venezuela, Chile, Colombia, Ecuador, Peru, and Bolivia, is a subregional economic unit within LAFTA. It is intended as a fourth power in Latin America to balance the big three: Argentina, Brazil and Mexico. The goals are to drop all subregional trade barriers within 12 years and adopt minimal external tariffs within five years.

Several agreements have been reached by 1968, including free commerce for 22 petrochemical products in the next five years. However, problems have been encountered with Venezuela, whose private businessmen feel that their relatively high cost enterprises will be swamped by direct competition and that their first priority is trade with the United States and Europe. Venezuela has recently requested a postponement of the next meeting of the Andean Bloc and is pushing for a longer integration period and more liberal escape clauses. There is a possibility that Venezuela may pull out of the Bloc, which would weaken the community to some extent.

Here, also, there is potential for television programs aimed at bolstering the progress of this multinational grouping. Perhaps the Andean unit offers a manageable community within which to share primary and secondary school ETV programs.

Advantages and Problems of Economic Integration

The need for economic integration in Latin America is great. In the postwar world, huge and successful trading blocs, such as the European Common Market, have made the traditional nation-state obsolescent in competition for overseas markets. Latin America is hemmed in by the giant marketing areas of Europe and the United States. Economic integration would give the nations of Latin America more bargaining power in dealing with a stronger, more unified Europe than would each of the same 20 nations independently.

Furthermore, for the past 50 years, Latin America has been trying to build an industrial society in small national compartments. Each nation has imported capital goods for manufacture and component parts for assembly, then sold the output to captive consumer publics who were denied access to competing materials by high tariffs. This substitution of imports was logical, but the system has never led to the free enterprise benefits of productivity, efficiency, or competitive pricing and has also forced ever higher debt burdens. After half a century, the possibilities of expansion through substitution of imports is running out, and there appears to be no way to attain a new industrial growth impetus except by increasing exports and regional markets.

However, economic integration confronts severe problems in Latin America. As was stated earlier, the economies of the nations of the OAS are competitive, not complementary. Monetary and fiscal policies differ in each nation, and instability has led to severe inflation in some. Deficiencies and lack of harmony in education and the shortage of trained personnel have resulted in an insufficient capacity to absorb scientific and technological progress. Transportation and communications facilities are woefully inadequate. And most importantly, Latin America is composed of some 20 separate nations, each at varying stages of development, and each with separate currency, tariff and fiscal policies, and administration.

Yet, it is precisely because the need for economic integration is so great and the problems are so complex that hemisphere-wide understanding is crucial, if economic integration is to succeed. Pan-American ETV provides a unique opportunity to build and encourage this necessary understanding.

Economic Development

Inter-American Development Bank (IDB)

Since its inception in 1960, the IDB has authorized $1.5 billion for development projects in Latin America, through 327 loans and 430 technical assistance operations. Its members are 19 independent republics of Latin America (excluding Cuba) and the United States.

The IDB is an important spokesman for Latin American interests in international economic forums, especially concerning external financing and the external public debt. The joint membership of all Latin American nations has increased their credit-worthiness to nonmembers.

The IDB is also a good example of inter-American cooperation. Although substantial funds come from the United States, the management of the IDB is Latin American, and the official language is Spanish. It maintains close contact with Latin American problems.

World Bank (IBRD)

The World Bank has designated more than one-fourth of its aggregate commitments to development for projects in Latin American nations, and it was in Latin America that it began its operations. More than half of these funds have gone into the expansion of power supplies and more than one-quarter into transportation, both important areas for multinational integration. Other funds have been disbursed for industrial and agricultural projects, telecommunication, urban water supplies, education, and technical assistance.

Most recently, the World Bank has agreed to aid the Colombian government in setting up its new comprehensive secondary high schools. The Bank studied the possibility of ETV in the classroom for these new schools and included provision for such media use in its loan to the Colombian government.

United Nations Economic Commission for Latin America (ECLA)

One of the four multinational regional commissions of the United Nations, ECLA is a grouping of member nations concerned with the economic and social problems prevailing in Latin America. With staff and headquarters located in Santiago, Chile, ECLA serves as a focal point where various regional needs and individual national problems can be discussed and where consideration can be given as to the best means of solving the problems by calling on one or more parts of the UN system.

ECLA has developed training facilities in the fields of statistics, public administration, housing and physical planning, demography, and child welfare. Advisory groups of experts under the auspices of the Commission work to advance development in industrial planning, community projects, agriculture, transport, and housing. A group of about 20 members is currently assisting Bolivia in the preparation of the 1962-1971 Bolivian plan for economic and social development. (See the report on Bolivia in Appendix B of Volume III of this report series.) Requests for similar advisory groups have been received from six other Latin American nations.

With the impetus provided by the Commission, some significant regional projects have been developed. ECLA has played a major role in the establishment of a Latin American common market and the Central American Economic Integration Program.

Cooperation and Economic Development

In assessing these multinational programs in economic development, a word of caution is necessary. Although the representative projects cited have been those dealing with cooperation and integration, the majority of projects carried out and funded by these agencies are primarily concerned with individual nations. Furthermore, their financial support comes primarily from the United States and other nations outside Latin America. The programs thus are often merely exchanges between international services and national governments, rather than examples of multinational cooperation. It must also be noted that, while many of these cooperative projects are impressive, they involve mostly technical and financial aid and do not bring about true participation in a larger inter-American community. For these reasons, cooperation in development is easier to achieve than economic integration.

This last comment, suggesting only partial success, may well be the result of a lack of understanding and popular support for multinational solutions to problems too large and complex for a nation to handle by itself. If an educational satellite is to be launched, it could be used as a powerful medium for dissemination of the story of achievement and the promise of strong beginnings of an inter-American network and of the problems still to be solved. This is the essence of the message that is most appropriate for a communication instrument as powerful as a satellite.

The recital of cooperative efforts across national borders is by no means complete. Examples can be cited in the areas of transportation and communications (to which President Jonnson made pointed reference in his San Salvador meetings), political and juridicial problems, education and culture, and social concerns. In each of these categories will be found rich content that needs the power of satellite communication to carry the message effectively to the people.

Transportation and Communications

Transportation and communications are among the most seriously inhibiting factors to integration in Latin America. Economies constructed in the colonial period, oriented toward the European metropolis and lacking in mutual interchange within Latin America, developed in isolation during the republican period, since they continued to be based on exports to external markets outside the region. Moreover, great geographic distances and a lack of communication and transportation systems within the continent tended to accentuate the effects of nationalistic patterns stemming from the 19th century.

Although it is 6,400 miles from Texas to Tierra del Fuego and 3,000 miles across the widest part of South America, the entire region has only 70,000 miles of paved roads, 45,000 miles of railroads, and only 3.5 million gross tons of ocean shipping. Since trade is oriented primarily towards Europe and the United States, land transportation, ocean shipping, and air travel are all organized in these direction. Even the simple aspects of intraregional intercourse such as mail, cables, and telephone service are most uncertain and contribute negatively to the expansion of trade as well as to the integration of the area.

However, some progress has been made in improving these facilities. The Pan American Highway will soon be completed, and studies are underway for a Bolivian Highway linking the Colombian-Venezuelan border to Santa Cruz, Bolivia. Cooperation has been achieved in ocean travel with the Latin American Shipping Association (ALAMAR), joined by 60 Latin American public and private companies. Intrazonal trade by water and the share of trade on Latin American ships has grown in recent years, and a new Latin American-wide service of the Lineas Marítimas Argentinas has just been instituted. The Association of Latin American Railroads (ALAF), is also a cooperative venture. Comprising representatives from seven nations, its problems have been obsolete equipment, operating deficits, and difficulties in raising international financing for modernization.

In the category of communication, only recently have telephone and radio nets linked the major population centers throughout the continent and isthmus. Satellite communication should help, particularly where terrain makes terrestrial links very expensive. The future for transportation and communication linkages are improving and, with it, the future of multinational cooperation.

Political and Juridicial Problems

The OAS has been the primary multinational body dealing with political problems in Latin America. Its historical roots, beginning with the Congress of Panama in 1826, have emphasized collective security and the settling of inter-American disputes by peaceful means.

The Meeting of Consultation of Ministers of Foreign Affairs and the OAS Council are the two OAS bodies that deal with defense and aggression.

Television programs could call attention to peaceful settlements of inter-American disputes, although care would have to be taken to present an unbiased approach to the issues. Other programs could deal with international law, common defense systems, and the work of the Inter-American Nuclear Engergy Commission (IANEC) to find peaceful application for nuclear energy.

The new constitution of Ecuador recognizes international law as the norm of conduct and defends the international community, and within it Latin American integration, as the effective system for achieving such a community. It includes provisions that empower the government to form, with one or more other nations, associations for the promotion and defense of international interests. It thus expresses direct reference to Latin American integration and to the possible establishment of organisms for defense of international interests in all fields. As such, it is a model for other Latin American nations to follow to provide the institutional framework for multinational integration, and thus deserves to be publicized throughout the hemisphere.

Education

Education and Development*

Education in Latin America is deficient in two crucial aspects: (1) lack of correspondence or relevance between the nature of the education received and the employment opportunities open to youth; and (2) lack of correspondence between the education received and the priority needs of the nations with regard to modernization and development. Extreme unevenness in distribution of educational opportunity continues to parallel and reinforce unevenness in distribution of incomes and wealth. Only certain minorities--generally the same as the minorities participating in economic advance--are able to take full advantage of the expanding supply of educational services. The differential participation of these minorities maintains in the educational systems biases that restrict their capabilities of attracting or supporting full participation by other strata. The participation attained by the lower-income majority in practically all nations of the region, like its participation in the new sectors of urban employment or in the market for consumer goods, remains marginal and frustrating.

Education at present, as a "resultant" of conflicting purposes and pressures, simultaneously contributes to and derives from: (1) the expansion of urban middle strata that have not yet been able to formulate clear objectives contributing to development and are oriented toward occupations for which the absorptive capacities of the economies are already saturated; and (2) the maintenance in a "marginal" position of much larger sectors of the population that are unable to benefit from economic growth or to participate fully in the shaping of policies for economic and social change.

To participate in a process of deliberate social change, the system of formal education is called on to perform the following functions:

- To act as an instrument for social cohesion, inculcating common values and developmental objectives among all social classes throughout the continent.

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* This section draws on arguments developed in the two papers by Marshall Wolfe listed in the bibliography, Appendix E.

- To act as an instrument for selection and social mobility, moving the best qualified into positions of leadership and technical specialization and moving large groups out of situations of marginality into full participation in the national societies.

- To act as a means of access to the political decision-making process and to participate in the wide variety of public roles associated with modern societies.

- To act as an instrument for the redistribution of income, since equalized educational opportunities would contribute to more nearly equal income-earning capacities.

- To act as an introduction to the world of work and as a supplier of the specialized manpower needed by developing societies.

Because of the existing deficiencies in education and the shortage of trained personnel for development tasks, Latin America has insufficient capacity to absorb technological and scientific progress. The nations best able to develop and assimilate contemporary technology today are the large nations with broad markets, large populations, and vigorous rates of expansion in their per-capita national income. Latin American integration is absolutely dependent on a rapid rate of absorption of technological and scientific resources. However, the absorption of these resources can hardly take place under adequate terms so long as Latin America does not develop joint scientific and technical activities that will enable the nations of the continent to share the tremendous cost of those ventures.

Recently the OAS, through its Inter-American Commission on Science and Technology, began planning for a Regional Scientific and Technological Development Program, with centers throughout Latin America. Perhaps a television program discussing the purposes of the plan would help to promote its execution.

UNESCO

UNESCO, both independently and in coordination with other UN agencies, has undertaken many projects for the development of education in Latin America. Among its programs, the following have implications for multinational cooperation:

- Starting in 1956, UNESCO began a major project on the extension and improvement of primary education in Latin America. More than 100 specialists have been trained in educational planning, and 1,000 fellowships were granted for study in the following areas: educational planning, school statistics, training of teachers, writing of textbooks, new teaching techniques, and school buildings. Eight interdisciplinary missions have studied the optimum financial aid. Five associated normal schools were founded to serve as model institutions for teacher training methods. This set of interlocking efforts could both utilize the broadcasts of a satellite and prepare multinational materials for broadcast to primary schools.

- UNESCO has provided technical assistance advising on education. An advisory mission for Central America in 1962 worked with the Central American University Council to study university reform and regional integration of advanced education. In Chile, a study was sponsored to reorganize the structure of the Catholic University of Valparaíso and coordinate its programs with other Chilean universities.

- UNESCO has contributed to the operation of several regional centers, including the Regional School Building Centre for Latin America, in Mexico City; the Fundamental Educational Centre for Community Development (CREFAL), in Pátzcuaro, Mexico; the Institute of Educational Films, in Mexico; the Office of Education for Latin America in Santiago; and the Educational Documentation Centre in Havana.

- In the field of technical education, UNESCO has sponsored 10 projects to ensure the initial functioning of engineering institutions on a post-graduate level that are multinational in character.

These efforts deserve hemisphere-wide publicizing and understanding.

Higher Education

Higher education in Latin America presents many obstacles to multinational integration. Based on 19th century notions of the perpetuation of an elite group, the universities of each nation developed separately, and most are stridently nationalistic. There are pronounced differences in the levels of Latin American universities. Nationalist elements in each nation oppose the admission of "outsiders" to professional standing. This feeling is reinforced by local professional jealousy and by thought that anything foreign is inferior to the native equivalent. The preference is for European or North American centers of higher education over institutions in other Latin American nations.

The lack of internal communication presents another obstacle to integration. The Latin American system of higher education is frozen into insular, rigid compartments. In the 19th and early 20th centuries, the universities formulated separate study programs for every profession, each completely independent. With the lack of internal communication within a single university community, it was hardly possible to implant the concept of close cooperation with institutions in other nations. But new general studies programs, common institutes for the basic sciences, and other systems of flexible and responsive education are now beginning to reshape the university in various parts of Latin America.

Among the more active of the multinational associations in higher education in the Americas, the following should be noted:

- The Central American University Council (CSUCA) is an association of Central American universities that have combined forces to do together what they cannot do alone. They have established a division of labor in specialized fields of study to provide better quality at lower cost.

- The Committee of Deans of Latin American Schools of Business Administration is an association of 12 institutions. Its goals are to promote the international dimension of the business curriculum and to achieve efficient operation by pooling some academic resources. Its projects have included work groups of professors, student and professor exchange, and standardization of admissions tests.

- The Colombian Universities Association is an organization of 25 public and private institutions in Colombia that has carried out cooperative programs. Exchange of views in this group has led to a sound basis of understanding for future integration programs and serves as a model for multinational cooperation among universities.

Inter-American Cultural Council (CIC)

The CIC, an arm of the OAS, renders technical services and promotes cooperation in the fields of education, science, and culture. In education, the CIC is concentrating on overall planning to improve school systems and administrations, provide better training for teachers, and develop uniform educational standards throughout Latin America.

In February 1968, the CIC established a special fund for a Regional Educational Development Program, with the objectives of intensifying inter-American Cooperation in education and promoting the integration of Latin America, through education, to raise the economic and social level of the region (an important step toward integration of the continent). Activities will be in the following areas: advanced training in educational planning and administration; ETV; educational research; harmonization of national curricula with the goals of Latin American integration; textbooks and teaching aids; university and school libraries; university modernization; teaching and research in the social sciences; vocational and technical education; and student welfare and guidance. This effort might well become a vital center for producing the content scripts for educational satellite programs.

Part of the special fund will also go to support a Regional Scientific and Technological Development Program. Among the program's projects are centers for basic and advanced training, coordination of regional scientific and technological agencies with economic and social agencies, exchange of professors and specialists, and dissemination of scientific and technological information. The above-mentioned Inter-American Commission on Science and Technology represents one of the efforts of the Inter-American Cultural Council.

The OAS also maintains fellowship and professorship programs, which come under the activities of the IA-ECOSOC. The Inter-American Cultural Council has recommended that these be expanded to include direct technical assistance for the establishment of national fellowship organizations in each nation, the establishment of public and private student loan agencies, and more grants to high level personnel in secondary education.

The OAS also supports international training centers in Latin America. They include, among others, the Inter-American Center for Public Administration, the Inter-American Statistical Training Center, and the Inter-American Program of Urban and Regional Planning.

Culture and Social Concerns

The Inter-American Cultural Council, in addition to performing its duties in formal education, maintains and supports programs aimed at preserving and utilizing the cultural heritage of each Latin American nation. Its projects include a Regional Program of School and University Library Development, a study of Representative Books of America, and programs for the restoration of historical monuments.

There is another OAS cultural organization, the Inter-American Music Council, that promotes the development of the art of music in all aspects, particularly in music education, contemporary composition, exchange of artists and works, and the compilation and study of traditional music. Such cultural activities could provide rich material for broadcasts, such as documentaries concerning monuments and their histories, reviews of important books of America, and concerts.

Conclusion

This paper has attempted to review the many aspects of multinational cooperation and commonality that are part of Latin America's past, present, and future. The common heritage of the continent and the current efforts at cooperation and integration are important themes about which the people know very little. Yet it is only through widespread understanding of the achievements as well as the problems of cooperation that further progress will be made. Multinational programming of these themes can make that understanding possible.

With the increase of multinational cooperation, the use of mass media for strengthening ties becomes more appealing. Perhaps the most dramatic means of transmitting a multinational message to all Latin nations is via satellite. In fact, such a new technology, in and of itself, could prompt officials to do so. Yet satellites are not the only way of effecting multinational program sharing. Currently, newsreels (usually French- and German-made) circulate around movie houses all over Latin America. Video tapes and microwave hook-ups could certainly provide means for sharing a common message. The important considerations, though, are: (1) the common desire for such multinational programs, and (2) agreement on content for such programs.

There might be a ready-made production center for multinational programming (at least for the initial effort) in the soon-to-be-designed multinational center for ETV. The establishment of such a center was decided at the Punta del Este conference of the OAS in April of 1967, and its very multinational nature could lend itself to programming in the interest of furthering multinational understanding.

Although programs treating Pan-American themes would be of prime concern, there would also be room for country-specific programs, such as travelogues, folklore presentations, or documentaries, which would enhance understanding among Latin Americans of different countries or regions. The emphasis could be on broadening the horizons of the average television viewer who may not have travelled to other provinces within his country, let alone to other countries. Even country-specific programs could profitably be produced by a multinational production unit, comprising personnel most skilled in such productions.

To achieve a maximum number of viewers, such programs would have to appeal to people of all educational backgrounds and with varied viewing tastes. Furthermore, it would be necessary to be mindful of regional differences in the Spanish language. (Note 1 at the end of this appendix briefly discusses these linguistic considerations.)

To recapitulate the argument with which we opened this paper: throughout prehistory and history, there have always been forces that caused the then-existing communities of men to join with other communities in solving problems that were beyond the capacities of older and smaller communities. Families joined with families to form tribes for hunting food or for defense against an unfriendly environment. Tribes or local communities united to form states. States joined states to form nations. Nations federated or conquered other nations to form empires or multinational communities. And finally, these larger-than-national units in an ever-expanding set of communities, incorporate into a world organization of lesser units. With each expansion, new dimensions are added to the lives of all participants. True, counterforces of splintering and disintegration vie with the unifying ones, but the expanding forces seem in the long stretch of history to be the more powerful. To us, the current period of history seems characterized by this worldwide trend for multinational communities to emerge and mature.

However, the threat of failure lurks in the background. The advances in the material and physical aspects could so far outstrip the attitudes and understandings and capacities of people that a rejection of modernization could result. The imbalance of material progress and lagging values and institutions is the danger that must be faced.

And here could be the vital message of such a worthy innovation as an educational satellite. This new media could blanket the continent with the story of the common heritage of all the Americas and could demonstrate dramatically the values to be gained by and the method of moving gradually and rationally toward the larger multinational institutional solutions to the problems and frustrations that plague us in this Western Hemisphere. The educational satellite holds too great a promise to improve the condition of man, to assign to it anything else than the most significant task of our time--the building of multinational communities of men.

Note 1 to Appendix C

LINGUISTIC CONSIDERATIONS FOR MULTINATIONAL SHARING OF ETV PROGRAMS

by Andrew D. Cohen

Except for Brazil, Latin America shares one language from Tijuana, Mexico, to Punta Arenas, Chile. India, not even one-third as large, has 15 official languages. Thus, in contrast to India, Latin America enjoys linguistic homogeneity. Yet some Latin officials question the degree of linguistic similarity from country to country. And if Latin American countries are going to share ETV programs across country boundaries, they must share one another's accents as well. Would such sharing offend the linguistic sensibilities of the local viewer?

Let us look first at pronunciation, then at words and expressions. One or two speech characteristics may tend to identify an accent with a particular country. For instance, Mexicans are said to speak melodically, almost as if singing, while Argentinians and Uruguayans have a distinctive way of pronouncing /ll/ and /y/. Yet in no country do all the inhabitants have the same accent. In fact, accents may vary as much from region to region within a country as they do from country to country.

For example, in lowland tropical areas throughout Latin America the speech is generally more rapid than in the highlands. The trilling of word initial /r/ or of /rr/ is longer, and the /s/'s are dropped from many words. In the highlands, the speech is generally more deliberate. The word initial /r/ and /rr/ are tapped, not trilled (in La Paz and Quito the sound is more like the affricate [š]) and the /s/'s are pronounced in most words. Thus, Venezuelan and Bolivian lowlanders have more in common in their speech than do Bolivian highlanders and their own lowlanders. The five-vowel sounds remain constant from country to country, except where Indian groups adapt Spanish vowels to their indigenous system. For example, the /i/ and /e/, and /o/ and /u/ may be interchanged by mistake, or the vowel sound may be somewhat in between the two.

So far, we have considered the pronunciation of the masses. But the man on the street is not the man in the television studio. The TV-teacher, or commentator (as in the case of public information broadcasts), probably does not possess a strong regional accent to begin with. Teachers are trained to speak Spanish as effectively as possible, and TV-teachers, particularly, are selected from among the best teachers in their respective fields. Furthermore, people engaged in mass media presentations, such as radio and television announcers, are specially trained to pronounce their Spanish in certain universal ways. Some regional sounds, for example, are simply incompatible with good broadcasting. For example, the word initial

/r/ and the /rr/ of the Andean Highland, which sound something like a "shuhhh," have an unpleasant effect over the air. Thus, broadcasters are trained to roll these /r/'s. By the same token, lowland broadcasters are trained to enunciate all /s/'s, so that words are more easily recognizable.

In the light of these considerations, the Spanish accent of television personnel would not be easily identifiable, or if indeed identifiable, it should be neutral enough to avoid offending viewers.

But whereas variations in pronunciation may not cause a problem to local viewers, variations in words and expressions may. For instance, countries often have different words to describe the same plants, animals, wearing apparel, or food. By the same token, different expressions may be used to convey the same idea. (Sometimes words and expressions vary by region in the same country, particularly in countries with large land masses and bad systems of transportation.) Furthermore, one country may have plants or animals, and so forth, that do not exist in other countries. Thus, the names for these would not be in the lexicon of another country.

In countries with Indian populations, as in Mexico, Guatemala, and the Andean block, the spoken Spanish may show the influence of the indigenous tongues, both in words and expressions. The Indian influence may even change grammatical forms in Spanish.

Officials in the ODECA Textbook Program of Central America have resolved their problem of regional words and expressions by having country representatives change words and expressions to suit their national culture before the books go to press. In the same way, editors from the participating countries could review the scripts for multinational television broadcasts, extracting words and expressions that are country- or region-specific.

The commercial television experience is that countries are most tolerant of outside offerings. Mexican soap operas, for instance, offer wide appeal through much of Latin America. Also, Mexican Spanish is used to dub many of the American television programs that are exported to Latin America. In these commercial programs, there generally are more colloquialisms than would be found in ETV programs, yet there seem to be no objections to differences in usage.

In conclusion, multinational sharing of programming, whether between Argentina and Uruguay or between Mexico and Chile, should not be largely hindered by linguistic differences. Pronunciation will not vary greatly, given the media training of the programmers. Regional words and expressions could be edited out, or the viewers could overlook them if they are properly motivated to receive the programs. If, for political or other motives, there is opposition to the broadcasting, then the argument of language difference might be stressed.

Appendix D

COMPUTER PRINTOUTS OF ECONOMIC ANALYSIS

by Andrew J. Lipinski

In this appendix, computer printouts for the following three programs are reproduced: educational support costs, rebroadcast satellite, and direct broadcast satellite. The sample printouts included in Section V of the main text of this volume are not repeated here. Printouts of the fourth program, for terrestrial distribution systems, are omitted to hold the report to a reasonable length. (A sample printout from the terrestrial program, for Bolivia, was included in Section V.)

The preparation of cost estimates for complex systems that may become available in the future is an activity subject to many hazards. The following pages discuss these problems for the benefit of users interested in the application of the results of the economic analysis conducted in the SRI study.

Cost assumptions affect the economic models used in the study in two distinct ways:

1. Cost elements are subject to uncertainty The uncertainty is less when costs are based on experience and the period for which they are estimated is not too far in the future. But as cost projections are extended farther and farther uncertainty increases, as does the variance between the future actual cost and the expected value used in the predictive model.

2. Even if the cost elements could all be known in advance, the relations between them that were assumed in the model may prove to be erroneous. For example, the model may assume that the future cost of one unit will decrease with the quantity ordered, but the rate of decrease may be wrongly chosen.

The Twin Dangers of Optimism and Pessimism

One purpose of constructing the economic models is to make a comparison of system costs, a comparison that might help decision-makers in structuring policy. The alternatives include systems based on existing technology and others based on new technology. But the designer of an economic model deals with much less uncertainty and has more information about the properties of systems that are already developed; the uncertainty that he faces is almost entirely in the properties and cost elements of the systems yet to come. Were he to cover his uncertainty by choosing costs figures on the high side for the new technology, he would, perhaps without even realizing it, largely negate the purpose for which the model was built. Thus, if he chooses a high estimate, he can always prove that the perpetuation of the existing system is economically the best.

The information sources available to help in estimating future costs elements can be broadly classified into the following categories:

- Manufacturers of the equipment who are suppliers of the new technology. If these sources exhibit any bias, it is the natural bias of the pioneer. For them, there is no question but that the forthcoming technology would offer lower costs.

- The users of new technology, such as Comsat and NASA. Comsat's operational personnel reflect the view of the user, even though at the same time, the engineering department of Comsat may be speaking the language of a pioneer. The same duality occurs in NASA; to hear the user's estimate, the project team consulted NASA administrators who have been faced with the managerial responsibility for putting into orbit the products of the new technology. Their experience has taught them to distinguish between the estimates of the "heroic" era and the costs that the administrators have to pay for the ongoing program.

The generalizations above are not only applicable to the designers and the users of the future system. They equally describe the departments of groupings in the administration of the country that may become a user of the new technology. Where the administrator is convinced that satellites would offer a significant advance towards the objectives that he espouses, his estimates of cost tend to reflect that point of view.

The Process of Estimating Cost Factors

During the course of the study, the SRI research team interviewed the experts and often found them in disagreement. At the same time, the team itself had a conception of what the future costs might be. The final estimate reflects the views of the experts, subjectively evaluated by the project team, and the team's own views.

Consider, for example, the cost of antennas for the direct broadcast satellite as a case in point. For the last 15 years, manufacturers of communications equipment have been purchasing microwave antennas. Diameters were of much the same order (say, up to 15 feet) as the antennas considered for the direct broadcast system; however, the quantities of any one production order were not very large (say, 1,000). In estimating the cost of antennas to be used with satellites, additional cost elements appear: for example, the tripod and the tracking mechanism. Also, the quantities are as much as ten times larger.

One way to estimate the costs would be to take the current price of one complete antenna set and to apply a typical learning curve. This process was found to be applicable to system elements that have a considerable history of manufacture, such as receivers, pre-amplifiers, and local oscillators

But when modern technology is forecasted to make a large impact on the fundamental manufacturing process, as it is in the case of the antennas for the direct-broadcasting satellite, the use of a manufacturing learning curve would be pessimistic. Therefore, the project team estimated the antenna costs of one set, to reflect the current state of knowledge; the projections made by others were then read (the Ascend* study, for instance, that assigned expected costs of $55 to 8-foot diameter antennas manufactured in quantities of 100,000). A gap was bridged between the two extremes of the first cost and the quantity cost by assuming that the cost will vary as the inverse of the square root of the quantity procured (the corresponding learning curve is about .75). This means that 15-foot diameter antennas will cost about $300 for a quantity of 75,000. The cost appeared to be of the right order of magnitude by another check: a 7-foot spun metal antenna can be purchased from a catalog for less than $30. A 15-foot antenna would be roughly four times larger, and at least four times as expensive. Advances in technology promise to produce cheaper plastic or foam antennas.

Because it is not known whether these advances will occur before 1975, and also because it is known that the whole concept of a direct broadcasting satellite is very sensitive to antenna costs, appropriate research has been suggested to better establish the expected costs.

Applicability of Cost Estimates to Foreign Conditions

Most of the cost assumptions were based on U.S. experience, because: (1) the project team was more familiar with the U.S. literature on the subject, and (2) the U.S. technology is, or would be, one of the few available to Latin America.

Salaries, local travel expenses, and so forth, were based on local levels but were expressed in U.S. dollars. Current dollars are used throughout.

Future Applications of SRI Models

It is hoped that the economic models developed during the course of this study may find applications as tools for decision-makers in areas outside of education; they are general enough to help in other areas where guidance is needed. But even if their use were to be confined to the choice of an educational system, the models can be used to offer further insights into the problem. The most obvious is the analysis of the sensitivity of the educational system to a change in the cost assumptions. The economic feasibility of the direct broadcast satellite depends on the expected cost of an antenna and, to a smaller degree, on the expected costs of the mixer pre-amplifier and local oscillator. For the rebroadcast satellite, over 50 Latin American earth stations were assumed. It would indeed be interesting to see what the costs might be, were stations to be purchased from the same manufacturer, and what might happen to the costs if 100 to 1,000 stations were built. The boosters assumed in the SRI report are the current family of boosters. What would happen if work currently in progress were to result in an extended capability of the Delta Booster? What would happen to the cost if INTELSAT IV satellites, with only minor modifications, were to find a common application in the domestic satellite efforts of Canada and the United States and in the educational applications of many countries?

---

* Stanford University, School of Engineering, Advanced System for Communications & Education in National Development (ASCEND), Stanford University, Stanford, California, June 1967.

Details of Cost Assumptions

Each of the four programs contains more than a dozen assumptions of cost variables. The rebroadcast satellite, alone, contains 34. It is not yet known, except intuitively, how critical each assumption is, and time allowed only a very tentative analysis of sensitivity to be made. Some of the assumptions require several pages of explanation. For these details, the reader is directed to Working Paper No. 6, by Andrew J. Lipinski, in Volume IV of this report series. A detailed discussion without the benefit of the actual equations connecting the cost variables might, at this point, be tedious and not particularly informative. Therefore, it is hoped that this introduction is sufficient to prepare the reader for the samples of the computer runs that are to follow and to qualify the implied precision of the analysis.

```
 RUN
L.MOLL-A.LIPINSKI-STANFORD RESEARCH INSTITUTE
PROJECT 7150-EDUCATIONAL SUPPORT COSTS

TYPED IN FIGURES MUST BE SEPARATED BY COMMAS
TYPE THE YEAR WHEN PROGRAM IS TO START
ANY YEAR FROM 1970 TO 1979
1972
TYPE HOURS OF PROGRAM GENERATED PER WEEK AT THE BEGINNING
AND AT THE END OF THE PROGRAM
37.6,69.5
TYPE THE DOLLAR COST OF ONE HOUR OF A NEW PROGRAM
500
FOR   37.6 HRS PER WEEK OF FINAL  MATERIAL,    3 STUDIOS ARE NEEDED
EQUIPMENT COSTS FOR  3 STUDIOS ARE:$  575.4 THOUSANDS
BUILDING COSTS FOR STUDIOS ARE $  225.0 THOUSANDS
TOTAL STUDIO COSTS ARE $   800490.
AND $ 800490. AT THE END

TYPE IN NO. OF SETS AT THE START,AND AT THE END
OF THE PROGRAM
3720,9455

TYPE YEARLY SALARY OF TEACHERS' INSTRUCTOR
3500

TYPE YEARLY SALARY ,TRAVEL COSTS OF SET MAINTENANCE TECHNICIAN
3500,1500
```

```
          ANNUAL PROGRAMMING AND TEACHER TRAINING COSTS
        INCLUDING OVERHEAD AND AMORTIZATION ($ THOUSANDS)

                        1970 1971 1972 1973 1974 1975 1976 1977 1978 1979
                        ---- ---- ---- ---- ---- ---- ---- ---- ---- ----
PERSONNEL COSTS            0    0  325  403  436  470  508  549  592  640
AMORT & UPKEEP EQT         0    0  126  126  126  126  126  126  126  126
AMORT & UPKEEP BLD         0    0    7    7    7    7    7    7    7    7
TEACHER INDOCTRIN.         0    0  117   45   52   60   68   78   89  102
SPPT LITERATURE            0    0  183  202  224  249  278  311  349  394
FIELD RESEARCH TMS         0    0   23   26   30   34   39   45   51   59
TOTAL ANNUAL COSTS         0    0  784  813  878  950 1029 1118 1218 1330

TV SETS IN USE ARE: (THOUSANDS)
                        0.0  0.0  3.7  4.2  4.8  5.5  6.3  7.2  8.2  9.4
SET MAINTENANCE COSTS ARE:

                        0.0  0.0 50.0 55.0 65.0 70.0 80.0 95.0 *105 *120

THE OVERALL ANNUAL COSTS ARE:
                           0    0  834  868  943 1020 1109 1213 1323 1450

THE COST OF SETS IS AS FOLLOWS:
                        0.0  0.0 *743 *850 *971 *110 *126 *144 *165 *189

THE COST OF ALL SETS IS:
   9937. THOUSAND $
```

```
THE STAFFING REQUIREMENTS ARE AS FOLLOWS:

          1970  1971  1972  1973  1974  1975  1976  1977  1978  1979
 GENMG      0     0     1     1     1     1     1     1     1     1
PGMDIR      0     0     1     1     1     1     1     1     1     1
DIRENG      0     0     1     1     1     1     1     1     1     1
PRODIR      0     0     9     9     9    12    12    12    12    15
GRPHIC      0     0     4     4     4     5     5     5     5     7
TECSUP      0     0     1     1     1     1     1     1     1     2
CAMERA      0     0     4     4     4     5     5     5     5     6
LIGHTS      0     0     1     1     1     1     1     1     1     2
AUDIO*      0     0     1     1     1     1     1     1     1     1
VIDEO*      0     0     1     1     1     1     1     1     1     1
TELCIN      0     0     1     1     1     1     1     1     1     1
VTROPS      0     0     2     2     2     3     3     3     3     4
MSTCON      0     0     1     1     1     1     1     1     1     1
TRAFIC      0     0     1     1     1     1     1     1     1     1
SCENES      0     0     1     1     1     1     1     1     1     1
FILMTR      0     0     1     1     1     1     1     1     1     2
CREWS*      0     0    21    21    21    28    28    28    28    35
TELTEA      0     0     9     9     9    12    12    12    12    15
SCRIPT      0     0     4     4     4     5     5     5     5     6
CURADV      0     0     3     3     3     4     4     4     4     5
UTILIZ      0     0    46    53    60    69    79    90   103   118
SET MT      0     0    10    11    13    14    16    19    21    24

STOPPED AT: 79.6
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>RUN
L.MOLL-A.LIPINSKI-STANFORD RESEARCH INSTITUTE
PROJECT 7150-EDUCATIONAL SUPPORT COSTS

TYPED IN FIGURES MUST BE SEPARATED BY COMMAS
TYPE THE YEAR WHEN PROGRAM IS TO START
ANY YEAR FROM 1970 TO 1979
1972
TYPE HOURS OF PROGRAM GENERATED PER WEEK AT THE BEGINNING
AND AT THE END OF THE PROGRAM
55,81.5
TYPE THE DOLLAR COST OF ONE HOUR OF A NEW PROGRAM
500
FOR    55. HRS PER WEEK OF FINAL  MATERIAL,    4 STUDIOS ARE NEEDED
EQUIPMENT COSTS FOR  4 STUDIOS ARE:$   767.3 THOUSANDS
BUILDING COSTS FOR STUDIOS ARE $  300.0 THOUSANDS
TOTAL STUDIO COSTS ARE $    1067320.
AND $1067320. AT THE END

TYPE IN NO. OF SETS AT THE START,AND AT THE END
OF THE PROGRAM
3112,6755

TYPE YEARLY SALARY OF TEACHERS' INSTRUCTOR
4500

TYPE YEARLY SALARY ,TRAVEL COSTS OF SET MAINTENANCE TECHNICIAN
4000,1500
```

```
               ANNUAL PROGRAMMING AND TEACHER TRAINING COSTS
             INCLUDING OVERHEAD AND AMORTIZATION ($ THOUSANDS)

                          1970 1971 1972 1973 1974 1975 1976 1977 1978 1979
                          ---- ---- ---- ---- ---- ---- ---- ---- ---- ----
PERSONNEL COSTS              0    0  476  548  576  605  635  667  701  736
AMORT & UPKEEP EQT           0    0  168  168  168  168  168  168  168  168
AMORT & UPKEEP BLD           0    0   10   10   10   10   10   10   10   10
TEACHER INDOCTRIN.           0    0  126   46   51   57   64   72   80   89
SPPT LITERATURE              0    0  261  279  298  31[illegible]  343  369  397  429
FIELD RESEARCH TMS           0    0   23   26   29   32   36   40   45   50
TOTAL ANNUAL COSTS           0    0 1066 1079 1134 1194 1259 1329 1404 1486

TV SETS IN USE ARE: (THOUSANDS)
                          0.0  0.0  3.1  3.4  3.8  4.3  4.8  5.4  6.0  6.7
SET MAINTENANCE COSTS ARE:

                          0.0  0.0 44.0 49.5 55.0 60.5 71.5 77.0 88.0 93.5

THE OVERALL ANNUAL COSTS ARE:
                             0    0 1110 1128 1189 1255 1330 1406 1492 1580

THE COST OF SETS IS AS FOLLOWS:
                          0.0  0.0 *622 *695 *776 *867 *969 *108 *120 *1350 ←

THE COST OF ALL SETS IS:
   7574. THOUSAND $
```

THE STAFFING REQUIREMENTS ARE AS FOLLOWS:

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
GENMG	0	0	1	1	1	1	1	1	1	1
PGMDIR	0	0	1	1	1	1	1	1	1	1
DIRENG	0	0	1	1	1	1	1	1	1	1
PRODIR	0	0	12	12	15	15	15	15	15	18
GRPHIC	0	0	5	5	7	7	7	7	7	8
TECSUP	0	0	1	1	2	2	2	2	2	2
CAMERA	0	0	5	5	6	6	6	6	6	7
LIGHTS	0	0	1	1	2	2	2	2	2	2
AUDIO*	0	0	1	1	1	1	1	1	1	2
VIDEO*	0	0	1	1	1	1	1	1	1	2
TELCIN	0	0	1	1	1	1	1	1	1	2
VTROPS	0	0	3	3	4	4	4	4	4	4
MSTCON	0	0	1	1	1	1	1	1	1	2
TRAFIC	0	0	1	1	1	1	1	1	1	2
SCENES	0	0	1	1	1	1	1	1	1	2
FILMTR	0	0	1	1	2	2	2	2	2	2
CREWS*	0	0	28	28	35	35	35	35	35	42
TELTEA	0	0	12	12	15	15	15	15	15	18
SCRIPT	0	0	5	5	6	6	6	6	6	7
CURADV	0	0	4	4	5	5	5	5	5	6
UTILIZ	0	0	38	43	48	54	60	67	75	84
SET MT	0	0	8	9	10	11	13	14	16	17

```
57.72 >RUN
L.MOLL-A.LIPINSKI-STANFORD RESEARCH INSTITUTE
PROJECT 7150-EDUCATIONAL SUPPORT COSTS

TYPED IN FIGURES MUST BE SEPARATED BY COMMAS
TYPE THE YEAR WHEN PROGRAM IS TO START
ANY YEAR FROM 1970 TO 1979
1972
TYPE HOURS OF PROGRAM GENERATED PER WEEK AT THE BEGINNING
AND AT THE END OF THE PROGRAM
62,36.5
TYPE THE DOLLAR COST OF ONE HOUR OF A NEW PROGRAM
500
FOR   62. HRS PER WEEK OF FINAL  MATERIAL,   5 STUDIOS ARE NEEDED
EQUIPMENT COSTS FOR  5 STUDIOS ARE:$  959.1 THOUSANDS
BUILDING COSTS FOR STUDIOS ARE $  375.0 THOUSANDS
TOTAL STUDIO COSTS ARE $   1334150.
AND $1334150. AT THE END

TYPE IN NO. OF SETS AT THE START,AND AT THE END
OF THE PROGRAM
1880,16718

TYPE YEARLY SALARY OF TEACHERS' INSTRUCTOR
4000

TYPE YEARLY SALARY ,TRAVEL COSTS OF SET MAINTENANCE TECHNICIAN
3500,1500
```

```
                 ANNUAL PROGRAMMING AND TEACHER TRAINING COSTS
                INCLUDING OVERHEAD AND AMORTIZATION ($ THOUSANDS)

                        1970 1971 1972 1973 1974 1975 1976 1977 1978 1979
                        ---- ---- ---- ---- ---- ---- ---- ---- ---- ----
PERSONNEL COSTS            0    0  537  605  631  658  686  715  746  777
AMORT & UPKEEP EQT         0    0  211  211  211  211  211  211  211  211
AMORT & UPKEEP BLD         0    0   13   13   13   13   13   13   13   13
TEACHER INDOCTRIN.         0    0   67   41   57   77  106  145  198  271
SPPT LITERATURE            0    0  278  299  326  359  402  459  535  638
FIELD RESEARCH TMS         0    0   12   17   24   32   45   61   84  114
TOTAL ANNUAL COSTS         0    0 1120 1188 1262 1352 1464 1605 1788 2026

TV SETS IN USE ARE: (THOUSANDS)
                        0.0  0.0  1.8  2.5  3.5  4.7  6.5  8.9 12.2 16.7
SET MAINTENANCE COSTS ARE:

                        0.0  0.0 25.0 35.0 45.0 60.0 85.0 *115 *155 *210

THE OVERALL ANNUAL COSTS ARE:
                           0    0 1145 1223 1307 1412 1549 1720 1943 2236

THE COST OF SETS IS AS FOLLOWS:
                        0.0  0.0 *376 *513 *702 *959 *131 *179 *244 *3349

THE COST OF ALL SETS IS:
  11443. THOUSAND $
```

```
THE STAFFING REQUIREMENTS ARE AS FOLLOWS:

              1970   1971   1972   1973   1974   1975   1976   1977   1978   1979
 GENMG          0      0      1      1      1      1      1      1      1      1
PGMDIR          0      0      1      1      1      1      1      1      1      1
DIRENG          0      0      1      1      1      1      1      1      1      1
PRODIR          0      0     15     15     15     15     15     18     18     18
GRPHIC          0      0      7      7      7      7      7      8      8      8
TECSUP          0      0      2      2      2      2      2      2      2      2
CAMERA          0      0      6      6      6      6      6      7      7      7
LIGHTS          0      0      2      2      2      2      2      2      2      2
AUDIO*          0      0      1      1      1      1      1      2      2      2
VIDEO*          0      0      1      1      1      1      1      2      2      2
TELCIN          0      0      1      1      1      1      1      2      2      2
VTROPS          0      0      4      4      4      4      4      4      4      4
MSTCON          0      0      1      1      1      1      1      2      2      2
TRAFIC          0      0      1      1      1      1      1      2      2      2
SCENES          0      0      1      1      1      1      1      2      2      2
FILMTR          0      0      2      2      2      2      2      2      2      2
CREWS*          0      0     35     35     35     35     35     42     42     42
TELTEA          0      0     15     15     15     15     15     18     18     18
SCRIPT          0      0      6      6      6      6      6      7      7      7
CURADV          0      0      5      5      5      5      5      6      6      6
UTILIZ          0      0     23     32     43     59     81    111    152    208
SET MT          0      0      5      7      9     12     17     23     31     42

STOPPED AT: 79.6
```

```
 RUN
L.MOLL-A.LIPINSKI-STANFORD RESEARCH INSTITUTE
PROJECT 7150-EDUCATIONAL SUPPORT COSTS

TYPED IN FIGURES MUST BE SEPARATED BY COMMAS
TYPE THE YEAR WHEN PROGRAM IS TO START
ANY YEAR FROM 1970 TO 1979
1972
TYPE HOURS OF PROGRAM GENERATED PER WEEK AT THE BEGINNING
AND AT THE END OF THE PROGRAM
53,133
TYPE THE DOLLAR COST OF ONE HOUR OF A NEW PROGRAM
500
FOR   53. HRS PER WEEK OF FINAL  MATERIAL,   4 STUDIOS ARE NEEDED
EQUIPMENT COSTS FOR  4 STUDIOS ARE:$  767.3 THOUSANDS
BUILDING COSTS FOR STUDIOS ARE $  300.0 THOUSANDS
TOTAL STUDIO COSTS ARE $    1067320.
AND $1067320. AT THE END

TYPE IN NO. OF SETS AT THE START,AND AT THE END
OF THE PROGRAM
1080,15793

TYPE YEARLY SALARY OF TEACHERS' INSTRUCTOR
4000

TYPE YEARLY SALARY ,TRAVEL COSTS OF SET MAINTENANCE TECHNICIAN
3500,1500
```

```
                 ANNUAL PROGRAMMING AND TEACHER TRAINING COSTS
               INCLUDING OVERHEAD AND AMORTIZATION ($ THOUSANDS)

                       1970 1971 1972 1973 1974 1975 1976 1977 1978 1979
                       ---- ---- ---- ---- ---- ---- ---- ---- ---- ----
PERSONNEL COSTS           0    0  459  627  703  789  885  993 1114 1250
AMORT & UPKEEP EQT        0    0  168  168  168  168  168  168  168  168
AMORT & UPKEEP BLD        0    0   10   10   10   10   10   10   10   10
TEACHER INDOCTRIN.        0    0   38   27   40   59   88  129  189  277
SPPT LITERATURE           0    0  228  262  305  360  433  533  676  888
FIELD RESEARCH TMS        0    0    7   10   15   23   34   50   74  108
TOTAL ANNUAL COSTS        0    0  913 1108 1245 1412 1620 1886 2234 2704

TV SETS IN USE ARE: (THOUSANDS)
                        0.0  0.0  1.0  1.5  2.3  3.4  5.0  7.3 10.7 15.7
SET MAINTENANCE COSTS ARE:

                        0.0  0.0 15.0 20.0 30.0 45.0 65.0 95.0 *135 *200

THE OVERALL ANNUAL COSTS ARE:
                          0    0  928 1128 1275 1457 1685 1981 2369 2904

THE COST OF SETS IS AS FOLLOWS:
                        0.0  0.0 *215 *316 *464 *681 *100 *146 *215 *315

THE COST OF ALL SETS IS:
   9459. THOUSAND $
```

```
THE STAFFING REQUIREMENTS ARE AS FOLLOWS:

            1970  1971  1972  1973  1974  1975  1976  1977  1978  1979
 GENMG        0     0     1     1     1     1     1     1     1     1
PGMDIR        0     0     1     1     1     1     1     1     1     1
DIRENG        0     0     1     1     1     1     1     1     1     1
PRODIR        0     0    12    12    15    15    18    21    24    24
GRPHIC        0     0     5     5     7     7     8    10    11    11
TECSUP        0     0     1     1     2     2     2     3     3     3
CAMERA        0     0     5     5     6     6     7     8     9     9
LIGHTS        0     0     1     1     2     2     2     3     3     3
AUDIO*        0     0     1     1     1     1     2     2     2     2
VIDEO*        0     0     1     1     1     1     2     2     2     2
TELCIN        0     0     1     1     1     1     2     2     2     2
VTROPS        0     0     3     3     4     4     4     5     6     6
MSTCON        0     0     1     1     1     1     2     2     2     2
TRAFIC        0     0     1     1     1     1     2     2     2     2
SCENES        0     0     1     1     1     1     2     2     2     2
FILMTR        0     0     1     1     2     2     2     3     3     3
CREWS*        0     0    28    28    35    35    42    49    56    56
TELTEA        0     0    12    12    15    15    18    21    24    24
SCRIPT        0     0     5     5     6     6     7     8     9     9
CURADV        0     0     4     4     5     5     6     7     8     8
UTILIZ        0     0    13    19    29    42    62    91   134   197
SET MT        0     0     3     4     6     9    13    19    27    40

STOPPED AT: 79.6
```

```
 RUN
L.MOLL-A.LIPINSKI-STANFORD RESEARCH INSTITUTE
PROJECT 7150-EDUCATIONAL SUPPORT COSTS

TYPED IN FIGURES MUST BE SEPARATED BY COMMAS
TYPE THE YEAR WHEN PROGRAM IS TO START
ANY YEAR FROM 1970 TO 1979
1972
TYPE HOURS OF PROGHAM GENEHATED PER WEEK AT THE BEGINNING
AND AT THE END OF THE PROGRAM
5,70.5
TYPE THE DOLLAR COST OF ONE HOUR OF A NEW PROGRAM
500
FOR   5. HRS PER WEEK OF FINAL  MATERIAL,   1 STUDIOS ARE NEEDED
EQUIPMENT COSTS FOR  1 STUDIOS ARE:$  191.8 THOUSANDS
BUILDING COSTS FOR STUDIOS ARE $   75.0 THOUSANDS
TOTAL STUDIO COSTS AHE $   266830.
AND $ 800490. AT THE END

TYPE IN NO. OF SETS AT THE START,AND AT THE END
OF THE PROGRAM
50,3863

TYPE YEAHLY SALARY OF TEACHERS' INSTRUCTOR
4500

TYPE YEAFLY SALARY ,TRAVEL COSTS OF SET MAINTENANCE TECHNICIAN
4000,1500
```

EDUCATIONAL SUPPORT
ARGENTINA

```
              ANNUAL PROGRAMMING AND TEACHER TRAINING COSTS
             INCLUDING OVERHEAD AND AMORTIZATION ($ THOUSANDS)

                     1970 1971 1972 1973 1974 1975 1976 1977 1978 1979
                     ---- ---- ---- ---- ---- ---- ---- ---- ---- ----
PERSONNEL COSTS         0    0   43   94  131  182  254  354  492  686
AMORT & UPKEEP EQT      0    0   42   42   42   42   42   84   84  126
AMORT & UPKEEP BLD      0    0    2    2    2    2    2    5    5    7
TEACHER INDOCTRIN.      0    0    2    2    4    7   14   26   50   93
SPPT LITERATURE         0    0   20   28   39   55   79  112  164  248
FIELD RESEARCH TMS      0    0    0    0    1    2    4    8   15   28
TOTAL ANNUAL COSTS      0    0  111  170  221  293  397  592  813 1191

TV SETS IN USE ARE: (THOUSANDS)
                      0.0  0.0  0.0  0.0  0.1  0.3  0.5  1.1  2.0  3.8
SET MAINTENANCE COSTS ARE:

                      0.0  0.0  5.5  5.5  5.5  5.5 11.0 16.5 33.0 55.0

THE OVERALL ANNUAL COSTS ARE:
                        0    0  116  176  226  299  408  608  846 1246

THE COST OF SETS IS AS FOLLOWS:
                      0.0  0.0 10.0 18.6 34.6 64.4 *119 *223 *415 *772

THE COST OF ALL SETS IS:
   1658. THOUSAND $
```

THE STAFFING REQUIREMENTS ARE AS FOLLOWS:

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
GENMG	0	0	1	1	1	1	1	1	1	1
PGMDIR	0	0	1	1	1	1	1	1	1	1
DIRENG	0	0	1	1	1	1	1	1	1	1
PRODIR	0	0	3	3	3	3	6	6	9	12
GRPHIC	0	0	1	1	1	1	2	2	4	5
TECSUP	0	0	0	0	0	0	0	0	1	1
CAMERA	0	0	2	2	2	2	3	3	4	5
LIGHTS	0	0	0	0	0	0	0	0	1	1
AUDIO*	0	0	1	1	1	1	1	1	1	1
VIDEO*	0	0	1	1	1	1	1	1	1	1
TELCIN	0	0	1	1	1	1	1	1	1	1
VTROPS	0	0	1	1	1	1	1	1	2	3
MSTCON	0	0	1	1	1	1	1	1	1	1
TRAFIC	0	0	1	1	1	1	1	1	1	1
SCENES	0	0	1	1	1	1	1	1	1	1
FILMTR	0	0	0	0	0	0	0	0	1	1
CREWS*	0	0	7	7	7	7	14	14	21	28
TELTEA	0	0	3	3	3	3	6	6	9	12
SCRIPT	0	0	2	2	2	2	3	3	4	5
CURADV	0	0	1	1	1	1	2	2	3	4
UTILIZ	0	0	0	1	2	4	7	13	25	48
SET MT	0	0	1	1	1	1	2	3	6	10

STOPPED AT: 79.6

```
 RUN
L.MOLL-A.LIPINSKI-STANFORD RESEARCH INSTITUTE
PROJECT 7150-EDUCATIONAL SUPPORT COSTS

TYPED IN FIGURES MUST BE SEPARATED BY COMMAS
TYPE THE YEAR WHEN PROGRAM IS TO START
ANY YEAR FROM 1970 TO 1979
1972
TYPE HOURS OF PROGRAM GENERATED PER WEEK AT THE BEGINNING
AND AT THE END OF THE PROGRAM
4,44.5
TYPE THE DOLLAR COST OF ONE HOUR OF A NEW PROGRAM
500
FOR    4. HRS PER WEEK OF FINAL  MATERIAL,    1 STUDIOS ARE NEEDED
EQUIPMENT COSTS FOR  1 STUDIOS ARE:$  191.8 THOUSANDS
BUILDING COSTS FOR STUDIOS ARE $    75.0 THOUSANDS
TOTAL STUDIO COSTS ARE $    266830.
AND $ 533660. AT THE END

TYPE IN NO. OF SETS AT THE START,AND AT THE END
OF THE PROGRAM
10,1092

TYPE YEARLY SALARY OF TEACHERS' INSTRUCTOR
2500

TYPE YEARLY SALARY ,TRAVEL COSTS OF SET MAINTENANCE TECHNICIAN
2500,1500
```

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             ANNUAL PROGRAMMING AND TEACHER TRAINING COSTS
           INCLUDING OVERHEAD AND AMORTIZATION ($ THOUSANDS)

                        1970 1971 1972 1973 1974 1975 1976 1977 1978 1979
                        ---- ---- ---- ---- ---- ---- ---- ---- ---- ----
PERSONNEL COSTS            0    0   34   71   96  130  175  237  320  433
AMORT & UPKEEP EQT         0    0   42   42   42   42   42   42   84   84
AMORT & UPKEEP BLD         0    0    2    2    2    2    2    2    5    5
TEACHER INDOCTRIN.         0    0    0    0    0    1    2    3    7   15
SPPT LITERATURE            0    0   16   22   29   40   54   74  102  142
FIELD RESEARCH TMS         0    0    0    0    0    0    0    1    2    5
TOTAL ANNUAL COSTS         0    0   96  138  171  216  278  362  523  686

TV SETS IN USE ARE: (THOUSANDS)
                         0.0  0.0  0.0  0.0  0.0  0.0  0.1  0.2  0.5  1.0
SET MAINTENANCE COSTS ARE:

                         0.0  0.0  4.0  4.0  4.0  4.0  4.0  4.0  8.0 12.0

THE OVERALL ANNUAL COSTS ARE:
                           0    0  100  142  175  220  282  366  531  698

THE COST OF SETS IS AS FOLLOWS:
                         0.0  0.0  2.0  3.9  7.6 14.9 29.2 57.1 *111 *218

THE COST OF ALL SETS IS:
    444. THOUSAND $
```

EDUCATIONAL SUPPORT
BOLIVIA

THE STAFFING REQUIREMENTS ARE AS FOLLOWS:

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
GENMG	0	0	1	1	1	1	1	1	1	1
PGMDIR	0	0	1	1	1	1	1	1	1	1
DIRENG	0	0	1	1	1	1	1	1	1	1
PRODIR	0	0	3	3	3	3	3	6	6	9
GRPHIC	0	0	1	1	1	1	1	2	2	4
TECSUP	0	0	0	0	0	0	0	0	0	1
CAMERA	0	0	2	2	2	2	2	3	3	4
LIGHTS	0	0	0	0	0	0	0	0	0	1
AUDIO*	0	0	1	1	1	1	1	1	1	1
VIDEO*	0	0	1	1	1	1	1	1	1	1
TELCIN	0	0	1	1	1	1	1	1	1	1
VTROPS	0	0	1	1	1	1	1	1	1	2
MSTCON	0	0	1	1	1	1	1	1	1	1
TRAFIC	0	0	1	1	1	1	1	1	1	1
SCENES	0	0	1	1	1	1	1	1	1	1
FILMTR	0	0	0	0	0	0	0	0	0	1
CREWS*	0	0	7	7	7	7	7	14	14	21
TELTEA	0	0	3	3	3	3	3	6	6	9
SCRIPT	0	0	2	2	2	2	2	3	3	4
CURADV	0	0	1	1	1	1	1	2	2	3
UTILIZ	0	0	0	0	0	0	1	3	6	13
SET MT	0	0	1	1	1	1	1	1	2	3

STOPPED AT: 79.6

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>RUN
L.MOLL-A.LIPINSKI-STANFORD RESEARCH INSTITUTE
PROJECT 7150-EDUCATIONAL SUPPORT COSTS

TYPED IN FIGURES MUST BE SEPARATED BY COMMAS
TYPE THE YEAR WHEN PROGRAM IS TO START
ANY YEAR FROM 1970 TO 1979
1972
TYPE HOURS OF PROGRAM GENERATED PER WEEK AT THE BEGINNING
AND AT THE END OF THE PROGRAM
1,52
TYPE THE DOLLAR COST OF ONE HOUR OF A NEW PROGRAM
500
FOR   1. HRS PER WEEK OF FINAL  MATERIAL,    1 STUDIOS ARE NEEDED
EQUIPMENT COSTS FOR  1 STUDIOS ARE:$  191.8 THOUSANDS
BUILDING COSTS FOR STUDIOS ARE $    75.0 THOUSANDS
TOTAL STUDIO COSTS ARE $    266830.
AND $ 800490. AT THE END

TYPE IN NO. OF SETS AT THE START,AND AT THE END
OF THE PROGRAM
60,4600

TYPE YEARLY SALARY OF TEACHERS' INSTRUCTOR
4000

TYPE YEARLY SALARY ,TRAVEL COSTS OF SET MAINTENANCE TECHNICIAN
3500,1500
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EDUCATIONAL SUPPORT
CHILE

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          ANNUAL PROGRAMMING AND TEACHER TRAINING COSTS
        INCLUDING OVERHEAD AND AMORTIZATION ($ THOUSANDS)

                           1970 1971 1972 1973 1974 1975 1976 1977 1978 1979
                           ---- ---- ---- ---- ---- ---- ---- ---- ---- ----
PERSONNEL COSTS               0    0    8   25   41   67  111  182  298  489
AMORT & UPKEEP EQT            0    0   42   42   42   42   42   42   84  126
AMORT & UPKEEP BLD            0    0    2    2    2    2    2    2    5    7
TEACHER INDOCTRIN.            0    0    2    2    4    8   15   28   53   98
SPPT LITERATURE               0    0    4    6   11   18   30   51   89  160
FIELD RESEARCH TMS            0    0    0    0    1    2    4    9   17   31
TOTAL ANNUAL COSTS            0    0   60   79  103  141  206  316  547  915

TV SETS IN USE ARE: (THOUSANDS)
                            0.0  0.0  0.0  0.1  0.2  0.3  0.7  1.3  2.4  4.6
SET MAINTENANCE COSTS ARE:

                            0.0  0.0  5.0  5.0  5.0  5.0 10.0 20.0 35.0 60.0

THE OVERALL ANNUAL COSTS ARE:
                              0    0   65   84  108  146  216  336  582  975

THE COST OF SETS IS AS FOLLOWS:
                            0.0  0.0 12.0 22.3 41.4 77.0 *143 *266 *494 *920

THE COST OF ALL SETS IS:
   1977. THOUSAND $
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EDUCATIONAL SUPPORT
CHILE

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THE STAFFING REQUIREMENTS ARE AS FOLLOWS:

          1970  1971  1972  1973  1974  1975  1976  1977  1978  1979
 GENMG      0     0     1     1     1     1     1     1     1     1
PGMDIR      0     0     1     1     1     1     1     1     1     1
DIRENG      0     0     1     1     1     1     1     1     1     1
PRODIR      0     0     3     3     3     3     3     3     6     9
GRPHIC      0     0     1     1     1     1     1     1     2     4
TECSUP      0     0     0     0     0     0     0     0     0     1
CAMERA      0     0     2     2     2     2     2     2     3     4
LIGHTS      0     0     0     0     0     0     0     0     0     1
AUDIO*      0     0     1     1     1     1     1     1     1     1
VIDEO*      0     0     1     1     1     1     1     1     1     1
TELCIN      0     0     1     1     1     1     1     1     1     1
VTROPS      0     0     1     1     1     1     1     1     1     2
MSTCON      0     0     1     1     1     1     1     1     1     1
TRAFIC      0     0     1     1     1     1     1     1     1     1
SCENES      0     0     1     1     1     1     1     1     1     1
FILMTR      0     0     0     0     0     0     0     0     0     1
CREWS*      0     0     7     7     7     7     7     7    14    21
TELTEA      0     0     3     3     3     3     3     3     6     9
SCRIPT      0     0     2     2     2     2     2     2     3     4
CURADV      0     0     1     1     1     1     1     1     2     3
UTILIZ      0     0     0     1     2     4     8    16    30    57
SET MT      0     0     1     1     1     1     2     4     7    12

STOPPED AT: 79.6

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 RUN
L.MOLL-A.LIPINSKI-STANFORD RESEARCH INSTITUTE
PROJECT 7150-EDUCATIONAL SUPPORT COSTS

TYPED IN FIGURES MUST BE SEPARATED BY COMMAS
TYPE THE YEAR WHEN PROGRAM IS TO START
ANY YEAR FROM 1970 TO 1979
1972
TYPE HOURS OF PROGRAM GENERATED PER WEEK AT THE BEGINNING
AND AT THE END OF THE PROGRAM
11.5,47
TYPE THE DOLLAR COST OF ONE HOUR OF A NEW PROGRAM
500
FOR   11.5 HRS PER WEEK OF FINAL  MATERIAL,    1 STUDIOS ARE NEEDED
EQUIPMENT COSTS FOR  1 STUDIOS ARE:$  191.8 THOUSANDS
BUILDING COSTS FOR STUDIOS ARE $    75.0 THOUSANDS
TOTAL STUDIO COSTS ARE $    266830.
AND $ 533660. AT THE END

TYPE IN NO. OF SETS AT THE START,AND AT THE END
OF THE PROGRAM
170,7071

TYPE YEARLY SALARY OF TEACHERS' INSTRUCTOR
3500

TYPE YEARLY SALARY ,TRAVEL COSTS OF SET MAINTENANCE TECHNICIAN
3500,1500
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              ANNUAL PROGRAMMING AND TEACHER TRAINING COSTS
            INCLUDING OVERHEAD AND AMORTIZATION ($ THOUSANDS)

                       1970 1971 1972 1973 1974 1975 1976 1977 1978 1979
                       ---- ---- ---- ---- ---- ---- ---- ---- ---- ----
PERSONNEL COSTS           0    0   99  157  187  223  266  317  378  451
AMORT & UPKEEP EQT        0    0   42   42   42   42   42   42   84   84
AMORT & UPKEEP BLD        0    0    2    2    2    2    2    2    5    5
TEACHER INDOCTRIN.        0    0    5    5    8   14   25   42   73  124
SPPT LITERATURE           0    0   47   56   68   83  102  127  164  221
FIELD RESEARCH TMS        0    0    1    1    3    5    8   15   25   44
TOTAL ANNUAL COSTS        0    0  198  265  312  371  447  548  732  931

TV SETS IN USE ARE: (THOUSANDS)
                        0.0  0.0  0.1  0.2  0.4  0.8  1.4  2.4  4.1  7.0
SET MAINTENANCE COSTS ARE:

                        0.0  0.0  5.0  5.0 10.0 15.0 20.0 35.0 55.0 90.0

THE OVERALL ANNUAL COSTS ARE:
                          0    0  203  270  322  386  467  583  787 1021

THE COST OF SETS IS AS FOLLOWS:
                        0.0  0.0 34.0 57.9 98.6 *168 *286 *487 *830 *1410

THE COST OF ALL SETS IS:
   3376. THOUSAND $
```

EDUCATIONAL SUPPORT
PERU

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THE STAFFING REQUIREMENTS ARE AS FOLLOWS:

             1970  1971  1972  1973  1974  1975  1976  1977  1978  1979
 GENMG          0     0     1     1     1     1     1     1     1     1
PGMDIR          0     0     1     1     1     1     1     1     1     1
DIRENG          0     0     1     1     1     1     1     1     1     1
PRODIR          0     0     3     3     6     6     6     6     9     9
GRPHIC          0     0     1     1     2     2     2     2     4     4
TECSUP          0     0     0     0     0     0     0     0     1     1
CAMERA          0     0     2     2     3     3     3     3     4     4
LIGHTS          0     0     0     0     0     0     0     0     1     1
AUDIO*          0     0     1     1     1     1     1     1     1     1
VIDEO*          0     0     1     1     1     1     1     1     1     1
TELCIN          0     0     1     1     1     1     1     1     1     1
VTROPS          0     0     1     1     1     1     1     1     2     2
MSTCON          0     0     1     1     1     1     1     1     1     1
TRAFIC          0     0     1     1     1     1     1     1     1     1
SCENES          0     0     1     1     1     1     1     1     1     1
FILMTR          0     0     0     0     0     0     0     0     1     1
CREWS*          0     0     7     7    14    14    14    14    21    21
TELTEA          0     0     3     3     6     6     6     6     9     9
SCRIPT          0     0     2     2     3     3     3     3     4     4
CURADV          0     0     1     1     2     2     2     2     3     3
UTILIZ          0     0     2     3     6    10    17    30    51    88
SET MT          0     0     1     1     2     3     4     7    11    18

STOPPED AT: 79.6
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 RUN
L.MOLL-A.LIPINSKI-STANFORD RESEARCH INSTITUTE
PROJECT 7150-EDUCATIONAL SUPPORT COSTS

TYPED IN FIGURES MUST BE SEPARATED BY COMMAS
TYPE THE YEAR WHEN PROGRAM IS TO START
ANY YEAR FROM 1970 TO 1979
1972
TYPE HOURS OF PROGRAM GENERATED PER WEEK AT THE BEGINNING
AND AT THE END OF THE PROGRAM
2.5,51
TYPE THE DOLLAR COST OF ONE HOUR OF A NEW PROGRAM
500
FOR   2.5 HRS PER WEEK OF FINAL  MATERIAL,   1 STUDIOS ARE NEEDED
EQUIPMENT COSTS FOR  1 STUDIOS ARE:$  191.8 THOUSANDS
BUILDING COSTS FOR STUDIOS ARE $    75.0 THOUSANDS
TOTAL STUDIO COSTS ARE $   266830.
AND $ 533660. AT THE END

TYPE IN NO. OF SETS AT THE START,AND AT THE END
OF THE PROGRAM
40,822

TYPE YEARLY SALARY OF TEACHERS' INSTRUCTOR
4500

TYPE YEARLY SALARY ,TRAVEL COSTS OF SET MAINTENANCE TECHNICIAN
4000,1500
```

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          ANNUAL PROGRAMMING AND TEACHER TRAINING COSTS
        INCLUDING OVERHEAD AND AMORTIZATION ($ THOUSANDS)

                         1970 1971 1972 1973 1974 1975 1976 1977 1978 1979
                         ---- ---- ---- ---- ---- ---- ---- ---- ---- ----
PERSONNEL COSTS             0    0   21   51   74  109  159  232  338  493
AMORT & UPKEEP EQT          0    0   42   42   42   42   42   42   84   84
AMORT & UPKEEP BLD          0    0    2    2    2    2    2    2    5    5
TEACHER INDOCTRIN.          0    0    1    1    1    3    4    7   11   17
SPPT LITERATURE             0    0   10   14   21   31   46   68  100  148
FIELD RESEARCH TMS          0    0    0    0    0    1    1    2    4    6
TOTAL ANNUAL COSTS          0    0   78  112  144  190  257  355  544  755

TV SETS IN USE ARE: (THOUSANDS)
                          0.0  0.0  0.0  0.0  0.0  0.1  0.2  0.3  0.5  0.8
SET MAINTENANCE COSTS ARE:

                          0.0  0.0  5.5  5.5  5.5  5.5  5.5  5.5 11.0 16.5

THE OVERALL ANNUAL COSTS ARE:
                            0    0   84  118  149  195  262  360  555  771

THE COST OF SETS IS AS FOLLOWS:
                          0.0  0.0  8.0 12.3 18.9 29.2 45.0 69.3 *106 *164

THE COST OF ALL SETS IS:
    453. THOUSAND $
```

EDUCATIONAL SUPPORT
URUGUAY

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THE STAFFING REQUIREMENTS ARE AS FOLLOWS:

                1970  1971  1972  1973  1974  1975  1976  1977  1978  1979
 GENMG            0     0     1     1     1     1     1     1     1     1
PGMDIR            0     0     1     1     1     1     1     1     1     1
DIRENG            0     0     1     1     1     1     1     1     1     1
PRODIR            0     0     3     3     3     3     3     6     6     9
GRPHIC            0     0     1     1     1     1     1     2     2     4
TECSUP            0     0     0     0     0     0     0     0     0     1
CAMERA            0     0     2     2     2     2     2     3     3     4
LIGHTS            0     0     0     0     0     0     0     0     0     1
AUDIO*            0     0     1     1     1     1     1     1     1     1
VIDEO*            0     0     1     1     1     1     1     1     1     1
TELCIN            0     0     1     1     1     1     1     1     1     1
VTROPS            0     0     1     1     1     1     1     1     1     2
MSTCON            0     0     1     1     1     1     1     1     1     1
TRAFIC            0     0     1     1     1     1     1     1     1     1
SCENES            0     0     1     1     1     1     1     1     1     1
FILMTR            0     0     0     0     0     0     0     0     0     1
CREWS*            0     0     7     7     7     7     7    14    14    21
TELTEA            0     0     3     3     3     3     3     6     6     9
SCRIPT            0     0     2     2     2     2     2     3     3     4
CURADV            0     0     1     1     1     1     1     2     2     3
UTILIZ            0     0     0     0     1     1     2     4     6    10
SET MT            0     0     1     1     1     1     1     1     2     3

STOPPED AT: 79.6
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>RUN

A.J.LIPINSKI  STANFORD RESEARCH INSTITUTE
THE REBROADCAST INSTRUCTIONAL SATELLITE

TYPE IN THE YEAR IN WHICH PROGRAM IS TO START
ANY YEAR FROM 1970 TO 1979
1972
TYPE-IN SYSTEM NOISE TEMPERATURE IN DEGREES
80 IS INTELSAT STANDARD,300 IS CHEAPER,1000 PASSABLE
300
REQUIRED PEAK TO PEAK/RMS RATIO,NO OF VIDEO CHANNELS
EXAMPLE 50,3  (45=ACCEPTABLE,50=GOOD,55=EXCELLENT)
55,12
NUMBER OF PROGRAM CHANNELS PER VIDEO
ONE FOR EACH MAJOR LANGUAGE?
1
NUMBER OF VOICE CHANNELS FOR OTHER USES
6
```

REBROADCAST SATELLITE

BRAZIL

```
TYPE-IN ANTENNA DIA FT,DOWNLINK FREQ. MH
15,4000
ORBIT-IF SYNCHR.TYPE 1,OTHERWISE HT. IN STAT.MILES
1
SIZE OF COVERAGE (MILES X MILES) ?
EXAMPLE 1000,4000
2500,4500
THE ANTENNA BEAMWIDTH IS
 11.8 DEGREES
TYPE-IN NO OF EARTH STATIONS REQUIRING TELEPHONY
3
NO OF RECEIVE ONLY STATIONS?
10

SAT POWER
WATTS
   284.5
SATELLITE WEIGHT- POUNDS
   831.5
SAT COST $MILLIONS
     7.2

BOOSTER ATLAS-AG-BII
BOOSTER CAN LIFT   3       SATELLITES
NOTE-LAUNCH COST INCLUDES TOTAL SAT. COMPLEMENT
UNLESS SPECIFIED (LATER ON),ALSO ONE BOOSTER IS ASSUMED IN RESERVE
THE BOOSTER COSTS ($ MILLIONS FOR ONE):
     8.4

SAT BWIDTH-MH
   499.1

TYPE-IN UP FREQ-MH
6000
```

REBROADCAST SATELLITE

BRAZIL

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REQUIRED TX POWER FOR TV TRANSMISSION OF ONE CHANNEL -WATTS
   214.6
IF ONE SATELLITE IS NEEDED TYPE 1,IF MORE TYPE 2
2
ON THE AVERAGE,HOW MANY VIDEO CHANNELS ARE NEEDED PER STATION
4

COST OF ONE TX-RX STATION,ITS RECEIVE AND TRANSMIT EQPT. $ MILLIONS
  0.640  0.239  0.083
COST OF RECEIVE ONLY STATION ITS RECEIVE EQPT. AND ANTENNA $ MILLIONS
  0.532  0.233  0.085
ALL STATIONS COST $ MILLIONS
  7.247
TOTAL SYSTEM COST $ MILLIONS
 44.590
ANNUAL EXPENDITURES BY CATEGORY AND YEARS $MILLIONS

       1970 1971 1972 1973 1974 1975 1976 1977 1978 1979

EXT HW  0.0  0.0 44.3  0.0  0.0 30.1  0.0  0.0 30.1  0.0
INT HW  0.0  0.0  1.4  0.0  0.0  0.0  0.0  0.0  0.0  0.0
EXT MP  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0
INT MP  0.0  0.0  0.7  0.7  0.7  0.7  0.7  0.7  0.7  0.7
TOT IN  0.0  0.0  2.1  0.7  0.7  0.7  0.7  0.7  0.7  0.7
TOT EX  0.0  0.0 44.3  0.0  0.0 30.1  0.0  0.0 30.1  0.0
 TOTAL  0.0  0.0 46.5  0.8  0.8 30.9  0.8  0.8 30.9  0.8

STOPPED AT: 86.11
```

REBROADCAST SATELLITE

ARGENTINA
BOLIVIA
CHILE
PERU
URUGUAY

```
>RUN

A.J.LIPINSKI  STANFORD RESEARCH INSTITUTE
THE REBROADCAST INSTRUCTIONAL SATELLITE

TYPE IN THE YEAR IN WHICH PROGRAM IS TO START
ANY YEAR FROM 1970 TO 1979
1972
TYPE-IN SYSTEM NOISE TEMPERATURE IN DEGREES
80 IS INTELSAT STANDARD,300 IS CHEAPER,1000 PASSABLE
300
REQUIRED PEAK TO PEAK/RMS RATIO,NO OF VIDEO CHANNELS
EXAMPLE 50,3  (45=ACCEPTABLE,50=GOOD,55=EXCELLENT)
55,12
NUMBER OF PROGRAM CHANNELS PER VIDEO
ONE FOR EACH MAJOR LANGUAGE?
1
NUMBER OF VOICE CHANNELS FOR OTHER USES
6
```

REBROADCAST SATELLITE

ARGENTINA
BOLIVIA
CHILE
PERU
URUGUAY

```
TYPE-IN ANTENNA DIA FT,DOWNLINK FREQ. MH
15,4000
ORBIT-IF SYNCHR.TYPE 1,OTHERWISE HT. IN STAT.MILES
1
SIZE OF COVERAGE (MILES X MILES) ?
EXAMPLE 1000,4000
2500,4500
THE ANTENNA BEAMWIDTH IS
 11.8 DEGREES
TYPE-IN NO OF EARTH STATIONS REQUIRING TELEPHONY
5
NO OF RECEIVE ONLY STATIONS?
26

SAT POWER
WATTS
   284.5
SATELLITE WEIGHT- POUNDS
   831.5
SAT COST $MILLIONS
    7.2

BOOSTER ATLAS-AG-BII
BOOSTER CAN LIFT   3      SATELLITES
NOTE-LAUNCH COST INCLUDES TOTAL SAT. COMPLEMENT
UNLESS SPECIFIED (LATER ON),ALSO ONE BOOSTER IS ASSUMED IN RESERVE
THE BOOSTER COSTS ($ MILLIONS FOR ONE):
   8.4

SAT BWIDTH-MH
   502.1

TYPE-IN UP FREQ-MH
6000
```

REBROADCAST SATELLITE

ARGENTINA
BOLIVIA
CHILE
PERU
URUGUAY

```
REQUIRED TX POWER FOR TV TRANSMISSION OF ONE CHANNEL -WATTS
   214.6
IF ONE SATELLITE IS NEEDED TYPE 1,IF MORE TYPE 2
2
ON THE AVERAGE,HOW MANY VIDEO CHANNELS ARE NEEDED PER STATION
4

COST OF ONE TX-RX STATION,ITS RECEIVE AND TRANSMIT EQPT. $ MILLIONS
  0.640  0.239  0.083
COST OF RECEIVE ONLY STATION ITS RECEIVE EQPT. AND ANTENNA $ MILLIONS
  0.532  0.233  0.085
ALL STATIONS COST $ MILLIONS
 17.049
TOTAL SYSTEM COST $ MILLIONS
 54.392
ANNUAL EXPENDITURES BY CATEGORY AND YEARS $MILLIONS

        1970 1971 1972 1973 1974 1975 1976 1977 1978 1979

EXT HW  0.0  0.0 52.1  0.0  0.0 30.1  0.0  0.0 30.1  0.0
INT HW  0.0  0.0  3.4  0.0  0.0  0.0  0.0  0.0  0.0  0.0
EXT MP  0.0  0.0  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
INT MP  0.0  0.0  1.7  1.7  1.7  1.7  1.7  1.7  1.7  1.7
TOT IN  0.0  0.0  5.1  1.7  1.7  1.7  1.7  1.7  1.7  1.7
TOT EX  0.0  0.0 52.3  0.1  0.1 30.3  0.1  0.1 30.3  0.1
 TOTAL  0.0  0.0 57.5  1.9  1.9 32.0  1.9  1.9 32.0  1.9

STOPPED AT: 86.11

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```

DIRECT BROADCAST SATELLITE
OPTION I
(2 SUPPLIERS OF 42,000 SETS)

CENTRAL AMERICA
MEXICO
COLOMBIA
VENEZUELA

```
>RUN




A.J.LIPINSKI STANFORD RESEARCH INSTITUTE
THE DIRECT BROADCAST INSTRUCTIONAL SATELLITE

TYPE IN THE YEAR IN WHICH PROGRAM IS TO START
ANY YEAR FROM 1970 TO 1979
1975
ANTENNA DIA (FT),DOWNLINK FR MHERTZ
15,4000

TYPE-IN RECEIVER NOISE FIGURE IN DB
THE RANGE IS FROM 4DB(EXCELLENT) TO 13 DB(POOR)
6
SPECIFY RX ENVIRONMENT
TYPE (1) COUNTRYSIDE (2) SUBURBS (3)TOWNS
TYPE HIGHER NUMBER IF MORE THAN ONE INVOLVED
I.E. TYPE EITHER 1, 2 OR 3
3
REQUIRED PEAK TO PEAK/RMS RATIO,NO OF VIDEO CHANNELS
EXAMPLE 50,3  (45=ACCEPTABLE,50=GOOD,55=EXC.)
55,12
NUMBER OF PROGRAM CHANNELS PER VIDEO
1
RF BANDWIDTH-MH
    501.6
```

DIRECT BROADCAST SATELLITE
OPTION I
(2 SUPPLIERS OF 42,000 SETS)

CENTRAL AMERICA
MEXICO
COLOMBIA
VENEZUELA

```
ORBIT-IF SYNCHR.TYPE 1,OTHERWISE HT. IN STAT.MILES
1
SIZE OF COVERAGE (MILES X MILES) ?
EXAMPLE 1000,4000
2500,4500
THE ANTENNA BEAMWIDTH IS
 11.8 DEGREES

FLUX DENSITY EXCEEDED BY  2.1 DB
SAT POWER
WATTS
   970.7
SATELLITE WEIGHT- POUNDS
  1643.4
SAT COST $MILLIONS
     15.7

BOOSTER ATLAS-AG-BII
BOOSTER CAN LIFT   1       SATELLITES
NOTE-LAUNCH COST INCLUDES TOTAL SAT. COMPLEMENT
UNLESS SPECIFIED (LATER ON),ALSO ONE BOOSTER IS ASSUMED IN RESERVE
THE BOOSTER COSTS ($ MILLIONS FOR ONE):
      8.4

NUMBER OF RECEIVER STATIONS
TO BE REACHED AT THE START AND THE END OF PERIOD
19500,42524
SAT BWIDTH-MH
    561.6
```

DIRECT BROADCAST SATELLITE
OPTION I
(2 SUPPLIERS OF 42,000 SETS)

CENTRAL AMERICA
MEXICO
COLOMBIA
VENEZUELA

```
IF ONE SATELLITE IS NEEDED TYPE 1,IF MORE TYPE 2
1
COST OF TUNER OR PRE-AMP BOUGHT IN QUANTITY
     60.8

HOW MANY SUPPLIERS WOULD PROVIDE ANTENNAS:?
2
COST OF AN ANTENNA BOUGHT IN QUANTITY
DOLLARS
   828.1
COST OF PRE-AMP AND FEED (DOLLARS)
   112.8

COST OF ONE STATION $ MILLIONS
  0.001129
INITIALLY THE STATIONS COST ($ MILLIONS)
     22.0

TYPE ANNUAL SALARY,TRANSPORT EXPENSE
MAINTENANCE TECHNICIAN
3500,1500
TOTAL SYSTEM COST $ MILLIONS
     54.6
ANNUAL EXPENDITURES BY CATEGORY AND YEARS $MILLIONS

         1970 1971 1972 1973 1974 1975 1976 1977 1978 1979

EXT HW    0.0  0.0  0.0  0.0  0.0 32.5  0.0  0.0 24.1  0.0
INT HW    0.0  0.0  0.0  0.0  0.0 22.0  4.7  5.7  6.9  8.5
EXT MP    0.0  0.0  0.0  0.0  0.0  0.2  0.2  0.3  0.3  0.4
INT MP    0.0  0.0  0.0  0.0  0.0  0.9  1.1  1.4  1.7  2.1
TOT IN    0.0  0.0  0.0  0.0  0.0 22.9  5.9  7.1  8.7 10.6
TOT EX    0.0  0.0  0.0  0.0  0.0 32.8  0.2  0.3 24.5  0.4
 TOTAL    0.0  0.0  0.0  0.0  0.0 55.7  6.1  7.5 33.3 11.1
STOPPED AT: 86.12
```

```
>RUN

A.J.LIPINSKI STANFORD RESEARCH INSTITUTE
THE DIRECT BROADCAST INSTRUCTIONAL SATELLITE

TYPE IN THE YEAR IN WHICH PROGRAM IS TO START
ANY YEAR FROM 1970 TO 1979
1975
ANTENNA DIA (FT),DOWNLINK FR MHERTZ
15,4000

TYPE-IN RECEIVER NOISE FIGURE IN DB
THE RANGE IS FROM 4DB(EXCELLENT) TO 13 DB(POOR)
4
SPECIFY RX ENVIRONMENT
TYPE (1) COUNTRYSIDE (2) SUBURBS (3)TOWNS
TYPE HIGHER NUMBER IF MORE THAN ONE INVOLVED
I.E. TYPE EITHER 1, 2 OR 3
3
REQUIRED PEAK TO PEAK/RMS RATIO,NO OF VIDEO CHANNELS
EXAMPLE 50,3  (45=ACCEPTABLE,50=GOOD,55=EXC.)
55,12
NUMBER OF PROGRAM CHANNELS PER VIDEO
1
RF BANDWIDTH-MH
   501.6
```

DIRECT BROADCAST SATELLITE

BRAZIL

```
ORBIT-IF SYNCHR.TYPE 1,OTHERWISE HT. IN STAT.MILES
1
SIZE OF COVERAGE (MILES X MILES) ?
EXAMPLE 1000,4000
2500,4500
THE ANTENNA BEAMWIDTH IS
 11.8 DEGREES

SAT POWER
WATTS
   487.9
SATELLITE WEIGHT- POUNDS
   949.9
SAT COST $MILLIONS
     8.3

BOOSTER ATLAS-AG-BII
BOOSTER CAN LIFT   2      SATELLITES
NOTE-LAUNCH COST INCLUDES TOTAL SAT. COMPLEMENT
UNLESS SPECIFIED (LATER ON),ALSO ONE BOOSTER IS ASSUMED IN RESERVE
THE BOOSTER COSTS ($ MILLIONS FOR ONE):
     8.4

NUMBER OF RECEIVER STATIONS
TO BE REACHED AT THE START AND THE END OF PERIOD
3400,15793
SAT BWIDTH-MH
   561.6
```

```
IF ONE SATELLITE IS NEEDED TYPE 1,IF MORE TYPE 2
2
COST OF TUNER OR PRE-AMP BOUGHT IN QUANTITY
   367.1

HOW MANY SUPPLIERS WOULD PROVIDE ANTENNAS:?
1
COST OF AN ANTENNA BOUGHT IN QUANTITY
DOLLARS
   679.4
COST OF PRE-AMP AND FEED (DOLLARS)
   439.0

COST OF ONE STATION $ MILLIONS
  0.001342
INITIALLY THE STATIONS COST ($ MILLIONS)
     4.5

TYPE ANNUAL SALARY,TRANSPORT EXPENSE
MAINTENANCE TECHNICIAN
3500,1500
TOTAL SYSTEM COST $ MILLIONS
    38.1
ANNUAL EXPENDITURES BY CATEGORY AND YEARS $MILLIONS

       1970 1971 1972 1973 1974 1975 1976 1977 1978 1979

EXT HW  0.0  0.0  0.0  0.0  0.0 33.5  0.0  0.0 25.1  0.0
INT HW  0.0  0.0  0.0  0.0  0.0  4.5  2.1  3.1  4.6  6.7
EXT MP  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.1  0.2
INT MP  0.0  0.0  0.0  0.0  0.0  0.1  0.2  0.3  0.5  0.7
TOT IN  0.0  0.0  0.0  0.0  0.0  4.7  2.3  3.5  5.1  7.5
TOT EX  0.0  0.0  0.0  0.0  0.0 33.6  0.0  0.0 25.3  0.2
 TOTAL  0.0  0.0  0.0  0.0  0.0 38.3  2.4  3.6 30.4  7.7
STOPPED AT: 86.12
```

DIRECT BROADCAST SATELLITE

ARGENTINA
BOLIVIA
CHILE
PERU
URUGUAY

```
A.J.LIPINSKI STANFORD RESEARCH INSTITUTE
THE DIRECT BROADCAST INSTRUCTIONAL SATELLITE

TYPE IN THE YEAR IN WHICH PROGRAM IS TO START
ANY YEAR FROM 1970 TO 1979
1975
ANTENNA DIA (FT),DOWNLINK FR MHERTZ
15,4000

TYPE-IN RECEIVER NOISE FIGURE IN DB
THE RANGE IS FROM 4DB(EXCELLENT) TO 13 DB(POOR)
4
SPECIFY RA ENVIRONMENT
TYPE (1) COUNTRYSIDE (2) SUBURBS (3)TOWNS
TYPE HIGHER NUMBER IF MORE THAN ONE INVOLVED
I.E. TYPE EITHER 1, 2 OR 3
3
REQUIRED PEAK TO PEAK/RMS RATIO,NO OF VIDEO CHANNELS
EXAMPLE 50,3  (45=ACCEPTABLE,50=GOOD,55=EXC.)
55,12
NUMBER OF PROGRAM CHANNELS PER VIDEO
1
RF BANDWIDTH-MH
    501.6
```

DIRECT BROADCAST SATELLITE

ARGENTINA
BOLIVIA
CHILE
PERU
URUGUAY

```
ORBIT-IF SYNCHR.TYPE 1,OTHERWISE HT. IN STAT.MILES
1
SIZE OF COVERAGE (MILES X MILES) ?
EXAMPLE 1000,4000
2500,4500
THE ANTENNA BEAMWIDTH IS
 11.8 DEGREES

SAT POWER
WATTS
   487.9
SATELLITE WEIGHT- POUNDS
   949.9
SAT COST $MILLIONS
     8.3

BOOSTER ATLAS-AG-BII
BOOSTER CAN LIFT   2      SATELLITES
NOTE-LAUNCH COST INCLUDES TOTAL SAT. COMPLEMENT
UNLESS SPECIFIED (LATER ON),ALSO ONE BOOSTER IS ASSUMED IN RESERVE
THE BOOSTER COSTS ($ MILLIONS FOR ONE):
     8.4

NUMBER OF RECEIVER STATIONS
TO BE REACHED AT THE START AND THE END OF PERIOD
1745,17448
SAT BWIDTH-MH
   561.6
```

DIRECT BROADCAST SATELLITE

ARGENTINA
BOLIVIA
CHILE
PERU
URUGUAY

```
IF ONE SATELLITE IS NEEDED TYPE 1,IF MORE TYPE 2
2
COST OF TUNER OR PRE-AMP BOUGHT IN QUANTITY
   312.0

HOW MANY SUPPLIERS WOULD PROVIDE ANTENNAS:?
2
COST OF AN ANTENNA BOUGHT IN QUANTITY
DOLLARS
  1292.9
COST OF PRE-AMP AND FEED (DOLLARS)
   373.1

COST OF ONE STATION $ MILLIONS
  0.001999
INITIALLY THE STATIONS COST ($ MILLIONS)
     3.4

TYPE ANNUAL SALARY,TRANSPORT EXPENSE OF ANTENNA
MAINTENANCE TECHNICIAN
3500,1500
TOTAL SYSTEM COST $ MILLIONS
    37.0
ANNUAL EXPENDITURES BY CATEGORY AND YEARS $MILLIONS

         1970 1971 1972 1973 1974 1975 1976 1977 1978 1979

EXT HW   0.0  0.0  0.0  0.0  0.0 33.5  0.0  0.0 25.1  0.0
INT HW   0.0  0.0  0.0  0.0  0.0  3.4  2.7  4.8  8.5 15.2
EXT MP   0.0  0.0  0.0  0.0  0.0  0.0  0.0  0.1  0.1  0.3
INT MP   0.0  0.0  0.0  0.0  0.0  0.0  0.1  0.2  0.4  0.8
TOT IN   0.0  0.0  0.0  0.0  0.0  3.5  2.8  5.1  9.0 16.1
TOT EX   0.0  0.0  0.0  0.0  0.0 33.6  0.0  0.1 25.3  0.3
 TOTAL   0.0  0.0  0.0  0.0  0.0 37.1  2.9  5.2 34.4 16.4
STOPPED AT: 86.12

>RUN
```

Appendix E

BIBLIOGRAPHY

General Background Material

Beeby, C. E., The Quality of Education in Developing Countries, Harvard University Press, Cambridge, 1966

Beneviste, Guy, and Wilbur Schramm, "The Economics of the New Educational Media," Working Paper of Document Prepared for International Institute for Educational Planning, UNESCO, Paris, France, February 1965

Berry, Paul C., "Education by Television in American Samoa," (Prepared for AID Office of Technical Cooperation and Research, Division of Research and Analysis), Hudson Institute, Inc., Harmon-on-Hudson, New York, July 30, 1965

Block, Dr. Clifford H., A Report on the Samoan Educational Television System, Agency for International Development, Office of Technical Cooperation and Research Office of Research and Analysis, August 1965

Coombs, Phillip H., Airborne Television Instruction and Better Quality Education, The Ford Foundation, Education Program, December 1960

Chu, Godwin C., and Wilbur Schramm, Learning from Television: What the Research Says, Report prepared for the U.S. Office of Education; Institute for Communication Research, Stanford University, Stanford, California, December 1967

Felstehausen, Herman, Improving Access to Latin American Agricultural Information through Modern Documentation Centers, The Land Tenure Center, Cooperative Program of American Nations, AID, and University of Wisconsin, January 1968

Ginzberg, Dr. Eli, The Development of Human Resources in Venezuela: An Overview, Colombia University, Graduate School of Business, Department of Economics, September 1964

Government of Peru, Statistics on Electrical Services 1964-1965-1966, Ministry of Public Works, Office of Electrical Fomentation, Government of Peru, Department of Statistics, January 1968

Henríquez, Cardenal Raúl Silva, "Communications Satellites and TV and Radio (Latin America)," Paper presented before World Conference of UNDA, International Catholic Association for Radio and TV, Munich, Germany, April 22-27, 1968

Heraud, Jorge A., and Jose C. Pomalaza, "Educational Television and Communications System for Latin America," Paper presented before Conference on The Economic Integration of Latin America, California Institute of International Studies with Stanford Electronics Laboratories, May 9-13, 1968

Herrera, Felipe, "Toward a Latin American Economic Community," President, Inter-American Development Bank, Rome, Italy, January 28, 1968

Hudson, Robert B., Preparatory Study of a Pilot Project in the Use of Satellite Communication for National Development Purposes in India, Advisory Panel on Space Communications, Third Session, UNESCO, Paris, France, December 13-15, 1967

Johnson, Leland L., "Some Implications of New Communications Technologies for National Security in the 1970s," Paper presented before Conference on Implications of New Communications Technologies for National Security in the 1970s, Elsinore, Denmark, September 28, 1967

Lessing, Lawrence, "Cinderella in the Sky--Satellites: Communications," Fortune, October 1967, p. 131

Lenkurt Electric Company, (Spanish-English) "Microwave for TV Transmission, January 1965," "Satellite Communications, December 1966," "Ground Stations for Satellite Communications, January 1967," Lenkurt Electric Company, San Carlos, California

López da Silva, Rector Onofre, Study and Solution of School Shortage through SETV, Document to Brazilian Ministry of Education and Culture, University of Rio Grande, Brazil, April 30, 1968

Lopes, Rector Onofre, New Educational Techniques through Satellites (Brazil), Universidade Federale do Rio Grande do Norte, Imprensa Universitária, May 1968

Marks, Leonard H., "How Communications Satellites Will Aid Education," Paper presented before Third Conference of the European Broadcasting Union for Educational Radio and TV, Paris, France, March 20, 1967

McClannan, Quinton B., Educational TV Via Satellite, Philco-Ford Corporation, 1967

Metzger, Sidney, "The Commercial Communications Satellite System 1963-68," Astronautics & Aeronautics, April 1968, pp. 42-51

National Institute of Planning, Economic and Social Development Plan for Education in Peru 1967-70, Ministry of Education, General Office of Education and Planning, 1966

OECD (Organisation for Economic Cooperation and Development), Education, Human Resources and Development in Argentina, OECD Publications No. 22,391, Paris, France, September 1967

Problems of Human Resources Planning in Latin America and in the Mediterranean Regional Project Countries, OECD Publications No. 22,207, Paris, France, October 1967

Rao, B. S., Prasad L. Vepa, and B. Y. Nerurkar, "Technical and Economic Aspects of Satellite ETV for India," Report submitted to Dr. Vikram A. Sarabhai, Chairman, Indian National Committee for Space Research, Department of Atomic Energy, Government of India, New Delhi, India, November 1967

Roberts, C. Paul, and Takako Kohdo, Statistical Abstract of Latin America, 1966, 10th Edition, Reference Series No. 5 (Library of Congress Catalog Card No. 56:63569), Latin American Center, University of California, Los Angeles, October 1967

Schramm, Wilbur, Phillip H. Coombs, Friedrich Kahnert, and Jack Lyle, The New Media: Memo to Educational Planners, UNESCO and International Institute for Educational Planning, Paris, France, 1967

Schramm, Wilbur, and Others, New Educational Media in Action: Case Studies for Planners, UNESCO and International Institute for Educational Planning, Paris, France, 1967

Stack, Bogdan R., "The Problems of U.S. International Telecommunications Industry," IEEE Transactions on Communications Technology, Vol. Com-15, No. 2, April 1967

__________, "The U.S. Telecommunications Policy: The Problem and the Challenge," Paper presented before the IEEE International Communication Conference, Philadelphia, Pennsylvania, June 12, 1968, Stanford Research Institute, April 1968

Stanford University, School of Engineering, Advanced System for Communications & Education in National Development (ASCEND), Stanford University, Stanford, California, June 1967

UNESCO (United Nations Educational, Scientific and Cultural Organization), Statistical Yearbook-Annuaire Statistique 1965, Imprimerie Joseph Floch, Mayenne, France, 1966

Meeting of Experts on the Use of Space Communications for Broadcasting, UNESCO House, Paris, France, January 24-26, 1968

United States Army, Area Handbook for Bolivia, August 1963

United States Government, Federal Communications Commission, Educational TV, Information Bulletin No. 16B, April 1968

Vision Magazine, Report on recent IDB Study on Higher Education in Latin America - Statistical Breakdown of Attendance and Fields Entered, May 24, 1968

Wallenstein, Ferd, "Integration of Satellites in a Worldwide Network of Telecommunications," (Spanish), Paper presented before Congress of Electrical Engineering and Mechanics Conference, Caracas, Venezuela, December 1966

Wenrick, Ernest D., "The Economic Problems of Satellite Communication," Paper presented before International Expert Meeting on Satellite Communication, Zurich, Switzerland, April 24-27, 1968, Stanford Research Institute, 1968

Westinghouse Defense and Space Center, Educational Television Distribution, Westinghouse Defense and Space Center, Aerospace Division, Report No. AA-3754, Unclassified, Baltimore, Maryland, July 31, 1963, Reprinted September 26, 1966

__________, Airborne/Satellite TV in Developing Countries, Westinghouse Defense and Space Center, Aerospace Division, Report No. J-1900, Baltimore, Maryland, August 1, 1966

Westinghouse Electric International, Application of Airborne Television in Saudi Arabia, Westinghouse Electric International, Report No. J-2371, January 1, 1968

Wolfe, Marshall, "Social Trends in Latin America." Sequel to Chapter XI in the 1963 Report on the World Social Situation, June 1967

Upton, T. Graydon, "U.S.-Latin American Relations and the Inter-American Development Bank," Address to 21st Annual Cleveland World Trade Conference, March 24, 1966, Inter-American Development Bank, Office of the Executive Vice-President

Multinational

Committee of deans of Latin America - Schools of Business Administration, Brief Statement of Purposes and Operations, Universidad del Valle, Divisi n de Ciencias Sociales y Economicas, Cali, Colombia, January 1968

IIEP (International Institute for Educational Planning), Problems and Strategies of Educational Planning - Lessons from Latin America, Selected Papers from the Seminar organized by IIEP at UNESCO House, April 6-May 8, 1964, IIEP, Paris, France

Montgomery, Paul L., "Hemisphere Fails to Meet Year-Old Goal for Growth (Latin America)," New York Times, April 16, 1968

OAS (Organization of American States), Declaration of the Presidents of America at the Meeting of American Chiefs of State, Punta del Este, Uruguay, April 12-14, 1967, Pan American Union, General Secretariat of the Organization of American States, Department of Information and Public Affairs, Washington, D.C., 1967

__________, Inter-American Cultural Council, Ad Hoc Committee on Education, Questionnaire on Educational Television and Outline for a Possible Multinational Educational Television Project (prepared by the General Secretariat), Pan American Union, General Secretariat of the Organization of American States, Department of Educational Affairs, Washington, D.C., OAS/Official Documents, OAS/Ser.J/VI, CIC/CAE/TV Experts Group, Doc. 3 (English), Original:Spanish, 13 September 1967

__________, Inter-American Cultural Council, Ad Hoc Committee on Education, Report of the First Meeting of the Group of Experts in Educational TV (prepared by the General Secretariat), Pan American Union, General Secretariat of the Organization of American States, Department of Educational Affairs, Washington, D.C., OAS/Official Documents, OAS/Ser.J/VI, CIC/CAE/Working Group, Doc. 7 (Spanish), Original:Spanish, 3 September 1967

OAS (Organization of American States), Inter-American Cultural Council, Ad Hoc Committee on Education, Multinational Project on Educational Television, Pan American Union, General Secretariat of the Organization of American States, Department of Educational Affairs, Washington, D.C., OAS/Official Documents, OAS/Ser.J/VI, CIC/CAE/Working Group, Doc. 26 (English), Original:Spanish, 22 November 1967

__________, Fifth Meeting of the Inter-American Cultural Council, Maracay, Venezuela, Report and Recommendations of the Ad Hoc Committee on Education (Topics IA and II of the Agenda), Pan American Union, General Secretariat of the Organization of American States, Department of Information and Public Affairs, Washington, D.C., Doc 4 (English), Original:Spanish, 21 December 1967

__________, Fifth Meeting of the Inter-American Cultural Council, Maracay, Venezuela, Multinational Projects (prepared by the General Secretariat), Pan American Union, General Secretariat of the Organization of American States, Washington, D.C., Doc. 4 Appendix I (English), Original:Spanish, 21 December 1967; Doc.4 Appendix II (English), Original:Spanish, December 21, 1967; Doc. 4 Appendix II, Addendum (English), Original: Spanish, 23 January 1968

__________, Fifth Meeting of the Inter-American Cultural Council, Maracay, Venezuela, Report of the Group of Experts on Science and Technology to the Inter-American Cultural Council on the Regional Scientific and Technological Development Program, Pan American Union, General Secretariat of the Organization of American States, Washington, D.C., Doc. 9 (English) Rev., Original:Spanish, December 11, 1967

OAS (Organization of American States), Fifth Meeting of the Inter-American Cultural Council, Maracay, Venezuela, February 15-22, 1968, Final Report (Provisional), Pan American Union, General Secretariat of the Organization of American States, Washington, D.C., Doc. 98, (English) Rev., Original:Spanish, 28 February 1968.

__________, Alliance for Progress Information Team, Directory of Agencies concerned with Latin American Development, Pan American Union, General Secretariat of the Organization of American States, Washington, D.C., Revised October 2 and November 3, 1967

ODECA (Organizacion de Estados Centroamericanos),

Informe de la Reunión, Primera Reunión de Directores de Planeamiento Educativo de Centroamerica, San Salvador, El Salvador, 30 de Enero a 2 de Febrero de 1967

Plan de Trabajo para 1968, Centro Regional de Libros de Texto, San Salvador, El Salvador, 3 de enero de 1968

Plan Operativo sobre Programas de Ensenanza, La Quinta Reunión Ordinaria del Consejo Cultural y Educativo de la ODECA

Discurso del Profesor Eduardo Bolaños, Director del Centro Regional de Libros de Texto de ODECA en la Inauguración del cursillo para Supervisores sobre el Uso de Textos Escolares, en la Cuidad Normal "Alberto Masferrer," el 13 de Mayo de 1968

Informe del Jefe de la Sección Educativa, 1° de octubre 1966 - 1° de octubre 1967, Departamento de Asuntos Culturales y Educativos, Sección Educativa, ODECA

Imprensas Secretaria General de la Organización de Estados Centroamericanos (ODECA)

Schenkkan, Robert, Thos. Livingston, Vernon Bronson, and William Kessler, The Feasibility of Using Television for Educational Development in El Salvador (Prepared for the United States Government, Agency for International Development, Washington, D.C.) National Association of Educational Broadcasters, July 1967

UNESCO (United Nations Educational, Scientific and Cultural Organization), Regional Meeting of Geographers to Improve the Teaching of Geography in Latin America, May 29-June 5, 1967, Santiago, Chile, UNESCO, International Geographical Union, Chilean Ministry of Education, and The University of Chile, Prensas de la Editorial Universitaria, Santiago Chile, 1967

__________, Latin American Seminar on Educational TV, Mexico City, Mexico, June 8-July 4, 1964, Imprimerie

United States Government, Federal Communications Commission, The Educational Broadcasting Branch, Educational Television, Inf. Bulletin No. 16B, April 1968

United States Government, Inter-American Development Bank, Socio-Economic Progress in Latin America, Social Progress Trust Fund, Seventh Annual Report, 1967

Wolfe, Marshall, "Education, Social Structures & Development in Latin America," Paper submitted to the Round Table on the Sociology of Education and Development - VI World Congress of Sociology - Evian - 4-11 September 1966, Economic Commision for Latin America, Social Affairs Division

Adult Education

ACPO, Annual Report of Acción Cultural Popular, Bogotá, Colombia, 1966

Bernal Alarcón, Hernando, Alonso Moncada, Lázaro Jiménez, ACPO--What is, What are the Objectives of, What does Acción Cultural Popular? Editorial Andes, Bogotá, Colombia, 1965

Cruzada ABC, Program of Literacy, Brazil, August 1967

Galat Noumer, José, Colombia una Gigantesca Escuela, Capacitación Popular, Imprenta Departamental "Antonio Nar No," Bogotá, Colombia

Gomez, Rafán, and Elías Ortega, Plan of Administrative Remodeling of National Program of Functional Literacy and Adult Education, Colombian Ministry of Education, Division of Literacy and Functional Education, March 1968

Government of El Salvador, Ministry of Education, Department of Fundamental Education," Basis for Organization and Functioning of New Educational Institutes for Adults in El Salvador," Prepared in cooperation with a Technical Mission from the Office of Adult Education, Venezuela, June 1965

Kearns, Robert E., Maryknoll Father, Radio School Project, Puno, Peru, Radio Schools of Puno, 1967

Lyle, Jack, Report on the Fondo de Capacitación Popular, The Ford Foundation, Bogotá, Colombia, February 23, 1968

Tumblin, J. A., Report on Adult Education in Latin America - Introduction to Country-by-Country Analysis, Agness Scott College, Decatur, Georgia, October 1967

UNESCO (United Nations Educational, Scientific and Cultural Organization), Project of Functional Literacy for San Salvador for Those Engaged in Industrial Occupations, UNESCO, December 1967

Teacher Training

Calvelo Rios, J. Manuel, Report on Application of ETV to Teacher Retraining, Chile, February 1967

Fadul, Dr. Dra. Pilar, Dr. Ignacio Ruíz, Sra. Rosa López de Manigat, Television Program for Development of Normal Schools, Colombia 1968

Primary and Secondary School

Daeman, Dalton, A Successful Experiment in South of Brazil, Pôrto Alegre, TV & Radio, Article 99, 1967

Foster, H. C., Report on Telescundaria Program, USIS, January 17, 1968

Government of Mexico, Division of Public Education, Calendario Escolar de Transmisiones para Telesecundaria, Mexico, 1967

__________, Manual de Organización para Telesecundaria, Mexico, 1967

Instituto Tecnológico y de Estudios Superiores de Monterrey, Departamento de Enseñanza por Televisión, Calendarios de Transmisiones para la Escuela Primaria, Enero a Junio de 1966 y Septiembre a Diciembre de 1967, Monterrey, Mexico

Le Fort, Javier, and Patricio Cariola, S. J., Some Aspects of Financing of Private Education in Latin America, CIDE (Center for Investigation and Development of Education), Santiago, Chile, May 1968

Lyle, Jack, Report on Progress (1965/1968) of ITV Program for Primary Schools in Colombia; UCLA (University of California, Los Angeles), Department of Journalism, Los Angeles, California, February 1968

Mercado López, Ricardo, Josefina Domínguez Pérez, and José Téllez Maciel, Purposes of Telesecundaria, Government of Mexico, Division of Audio-Visual Public Education, Mexico 1967

Mercado López, Ricardo, and Rosa Ma. Carreto de Escalona, Correos de Telesecundaria, Ano 1, No. 1 & 2, October and November 1967

Technical Training

CINTERFOR, Inter-American Center for Research and Documentation of Professional Training,

De Simone, José A., Coordination between Professional Training and Technical Instruction, 1967

1st Seminar on the Organization and Planning of Professional Training, Rio de Janeiro, Brazil, October 1964

Horowitz, Morris A., Manuel Zymelman, The Brazilian Intensive Vocational Training Program and Methodology, Cinterfor Informes, Montevideo, Uruguay, 1967

Instances of Programs in Professional Training in Latin America, 1967

Technical Reunión on New Methods on Professional Training, Caracas, (In collaboration with INCE and USAID) Venezuela, November 15-26, 1965

Felstehausen, Herman, The Colombian Problem, University of Wisconsin, Land Tenure Center, September 1967

Garrison, Ray L., Senati Survey for Colombia, Colombia University Teachers College, December 1967

Havens, Eugene A., Education in Rural Colombia, Report for Year Ending December 31, 1967, "An Investment in Human Resources," University of Wisconsin, Land Tenure Center, February 1965

INACAP (National Institute of Professional Training),

Resume of Activities for 1967, January 25, 1968

Augustín, Albert S., and Guillermo del Campo, Manpower Development for Industrialization in Chile

INCE (Instituto Nacional de Cooperación Educativa),

Annual Report for 1966, Venezuela

Technical Bulletin

SENA (Servicio Nacional de Aprendizaje), Quantitative Analysis of Occupational,

Training for 1966, Colombia, January 1968

Decade of Service for Colombia, 1957-1967

Higher Education

Benson, Charles, and Pedro Rojas, Prelinimary Report and Recommendations on Financial Aspects of Colombian Higher Education, Submitted to Associación Colombiana de Universidades - Fondo Universitario Nacional, The United States Agency for International Development, and The University of California, University of California, Advisory Mission, Colombian Higher Education Project, Bogotá, Colombia, February 1967

Feliz, George C., Preliminary Report and Recommendations on Standards and Accreditation: Instruments for Improving Higher Education in Colombia, Submitted to Associación de Universidades-Fondo Universitario Nacional, The United States Agency for International Development, and the University of California, University of California, Advisory Mission, Colombian Higher Education Project, Bogotá, Colombia, February 1967

__________, Report and Recommendations for the Development of Higher Education in Colombia, Submitted to Associación Colombiana de Universidades - Fondo Universitario Nacional, The United States Agency for International Development, and The University of California, University of California, Advisory Mission, Colombian Higher Education Project, Bogotá, Colombia, February 1967

__________, A Guide for the Development of Graduate Studies in Colombian Universities, A Proposal Submitted to Associación de Universidades - Fondo Universitario Nacional, The United States Agency for International Development, and The University of California, Advisory Mission, Colombian Higher Education Project, Bogotá, Colombia, February 1967

Lagúnez Guevara, Mario, (IPN) Report on Centro de Televisión Educativa de Zacatenco, Mexico, January 13, 1967

Program Production in Television

Baxter, John, Report on Closed Circuit TV Work at University of Buenos Aires, July 15, 1962

Calvelo Rios, J. Manuel, Cultural and Educational TV (Chile) Additional Information for Ministry of Education, Program for One Year of Labor - March/April 1967, Project of TV School - July 1967, Antecedents - May 1968, Chilean Government, Ministry of Education, Santiago, Chile

CEMAV (Center for Audiovisual Media), Information Bulletin Ano 1, No. 1, Universidad Nacional de Colombia, Bogotá, Colombia, March 1968

Comstock, George, Nathan Maccoby, and Patricia Comstock, The Peace Corps Educational Television (ETV Project in Colombia-Two Years of Research), Stanford University, Institute for Communications Research, November 1966

CONAPLAN (Consejo Nacional de Planificación y Coordinación Economica)

"ETV in El Salvador," written by Department of Programming and Development of Social Sectors, in collaboration with Department of ETV and Ministry of Education, Government of El Salvador, March 1968

Foley, Theodore T., Plan Básico Classroom Evaluation (El Salvador), United States Agency for International Development, Department of Education, Washington, D.C., May 10, 1968

Government of El Salvador, General Information and Working Plan for 1968 with Future Organization of the Department and Time-Table of Activities at Plan Básico and Primary School Levels through 1972, Department of ETV, El Salvador

Government of Venezuela, Ministry of Education, Audiovisual Center, Technical Section.

Schedules of programs for Kindergarten, 4th and 6th grades

Scripts

Evaluation Sheet for Monitors

List of Norms for Classroom Utilization

Torres, Juan, series of articles (5), Educacion, Ministry of Education

Johnson, Hal, Organization and Administration of USAID's Educational Reform Instructional TV Project (El Salvador), United States Agency for International Development, Chief Education Adviser, Washington, D.C., April 15, 1968

NAEB (National Association of Educational Broadcasters), The Feasibility of Using ETV for Educational Development in El Salvador, in collaboration with AID, July 1967